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WILSON (J. D.) & RUNNELS (H. A.). **Latest method on anthracnose control.**—*Food Packer*, xxvi, 1, pp. 54–55, 1945.

Data are presented from 12 of the 17 replicates of the 1944 co-operative experiment on the control of tomato anthracnose [*Colletotrichum phomoides*: *R.A.M.*, xxiv, p. 168], in which three treatments were used, viz., fermate+calcium arsenate 2–4–100, tribasic+calcium arsenate 4–4–100, and the same two formulae in alternating applications beginning and ending with fermate. The average incidence of infection in the plots receiving three treatments, in the order as given, and in the controls was 5, 7·29, 4·65, and 13·66 per cent., respectively, the yields per 50 plants 526, 534, 534, and 492 lb., respectively, and the crop value $259, 274, 281, and 237, respectively.

RIGG (T.), KIDSON (E. B.), & CHITTENDEN (E. T.). **The effects of steam and soil disinfectants on the yield and quality of Nelson Tomatoes under outside culture.**—*N.Z. J. Sci. Tech.*, A, xxvi, 4, pp. 183–186, 1944.

A great improvement in the growth, yield, and quality of Potentate tomatoes was effected in experimental plots at Nelson, New Zealand, by steaming the soil to a depth of 14 in., using a grid at a pressure of 100 lb. per sq. in., and by the application of 40 per cent. formalin at the rate of $\frac{1}{6}$ gal. per sq. yd. Production was increased by nearly 25 per cent. by both treatments, and the incidence of 'hard core', a common defect characterized by a hard, pithy condition of the flesh, especially at the stalk end, which prevents ripening and severely impairs the culinary and canning value of the tomatoes, was reduced from 48·2 to 26·3 and 9·4 per cent. by formalin and steaming, respectively.

RALEIGH (S. M.) & CHUCKA (J. A.). **Effect of nutrient ratio and concentration on growth and composition of Tomato plants and on the occurrence of blossom-end rot of the fruit.**—*Plant Physiol.*, xix, 4, pp. 671–678, 1944.

A tabulated account is given of investigations at the Maine Agricultural Experiment Station in 1939 and 1940 to determine the effects of different nutrient ratios and concentrations on tomato growth, chemical composition, and tendency to blossom-end rot [*R.A.M.*, xvi, p. 502]. The plants (Marglobe) were grown out-of-doors in 2-gal. crocks filled with sieved and washed silica sand and supplied with solutions of six major elements by the subirrigation method (*J. agric. Res.*, liii, pp. 693–702, 1936). Blossom-end rot developed at comparatively low osmotic values, and in no instance could the disorder be attributed to the osmotic value. The disorder was induced by high nitrogen, high sulphur, high magnesium, high potassium, high chlorine, and low calcium, and the evidence indicated that the balance between the elements is a more important factor than the actual concentration of the elements or the osmotic concentration of the solution. It also appears that the unbalanced condition causes the disorder by preventing the utilization of the necessary amount of calcium for normal fruit production, for in the experiment recorded, whenever the calcium content of the fruit fell below 0·20 per cent. blossom-end rot generally occurred on some of the fruits.

Clarke (E. J.) & Sherrard (G. O.). **A leaf-spot on Tomatoes and its relationship to the variety Vetomold.**—*Gdnrs' Chron.*, Ser. 3, cxvii, 3034, p. 71, 1945.

The performance of the Vetomold tomato in Eire has been generally disappointing, since notwithstanding its immunity from leaf mould (*Cladosporium*) [*fulvum*], it yields only about half as much as a heavy-cropping susceptible variety, such as Scarlet Knight. In addition to this and other undesirable features, Vetomold has proved unsuitable as a parent in crosses with superior commercial tomatoes, mainly owing to an apparently constitutional defect behaving as a recessive character and expressed by the development on the leaf blades of pale yellow-green, rather small spots of indefinite outline, which gradually expand and often coalesce into large, irregular necrotic areas with red-brown centres. In experiments at the Albert Agricultural College, Glasnevin, Dublin, there was a quasi-complete negative correlation between the occurrence of this disorder and leaf mould in the progeny of crosses between Vetomold and commercial varieties. Thus, out of 75 F_2 plants of Vetomold × Scarlet Knight, 39 were healthy, 17 were affected by leaf spot, 18 by *C. fulvum*, and only one by the two diseases together, the corresponding proportions for 77 of Vetomold × Victory being 32, 20, 15, and 0, respectively. A similar relationship holds good with other leaf mould-resistant strains, as exemplified by a cross between Ailsa Craig and one of the latter, from which four F_4 families were selected containing, respectively, 18, 19, 19, and 17 plants. Of these, family (1) comprised 3 healthy, 13 with leaf spot, two with leaf mould, and 0 with the latter disease suppressed and without leaf spot; the corresponding figures for (2), (3), and (4) were 2, 15, 1, and 1; 3, 4, 2, and 10; and 1, 0, 6, and 10, respectively.

Even before the advent of Vetomold, the form of leaf spot under observation was familiar to the writers in a leaf mould-resistant strain imported from Massachusetts, in selections from which and crosses with commercial varieties it has since developed sporadically. It is also a feature of crosses between the Canadian Allred, introduced in 1939, and commercial varieties. Leaf spot has further been reported from various Dublin nurseries as occurring in crosses between Vetomold and standard varieties in an approximate 3 : 1 ratio, and is believed to be present in other parts of Eire.

[Day (W. R.).] **Forest pathology.**—*Rep. Imp. For. Inst., Oxford, 1943–44*, pp. 7–8, 1944.

In this report [cf. *R.A.M.*, xxiii, p. 200] it is stated that Corsican pine [*Pinus nigra* var. *calabrica*] in England and Wales is suffering from a widespread and locally serious die-back due to frost injury. Severe needle cast associated with *Hypodermella sulcigena* [ibid., xix, p. 54] was also recorded, but no die-back was associated with this, and there is hope that no permanently serious injury will result. Both diseases were most serious in situations where the air was stagnant and good early growth favoured.

Specimens of poplar, willow [*Salix*], and cherry showing canker due to frost injury were received from various parts of Scotland and England.

Bacterial canker of poplar [ibid., xiii, p. 408; xviii, p. 68] continues to spread on susceptible types, such as *Populus eugenii*. In the south of England, *Stereum spadiceum* [ibid., xvi, p. 4] caused serious rot throughout an oak wood.

Lohwag (H.). **Zum Sterben der Bäume im Lainzer Tiergarten (Wien).** [On the dying-off of the trees in the Lainz Zoological Garden (Vienna).]—*Zbl. ges. Forstw.*, lxviii, 10, pp. 179–197, 10 figs., 1942. [Received 1944.]

Wood-destroying fungi responsible for the increasingly heavy losses observed of late years among the magnificent trees of the Lainz Zoological Garden, Vienna

[cf. *R.A.M.*, xxiii, p. 368], include *Fomes fomentarius* and *Ganoderma laccatum* on beech, *Polyporus sulphureus* on various hard- and softwoods, *Fomes hartigii* on fir (*Abies*) [ibid., xxi, p. 56], *F. robustus* and *Phellinus* [*Polyporus*] *dryadeus* on oak [loc. cit.], and *P. squamosus* (relatively rare in the Zoological Garden but common on limes (*Tilia*), planes [*Platanus*], and *Celtis* in parks and gardens).

Zentmyer (G. A.), Wallace (P. P.), & Horsfall (J. G.). **Distance as a dosage factor in the spread of Dutch Elm disease.**—*Phytopathology*, xxxiv, 12, pp. 1025–1033, 1 diag., 1 graph, 1944.

The statistical analysis of data from three plots used for studies on the spread of Dutch elm disease (*Ceratostomella ulmi*) from large, naturally infected trees in Connecticut showed that the probability of attack on a given tree decreased directly with the logarithm of the distance from the source of contamination. The mode of spread of the pathogen thus conforms to the dose-response relation observed in other scientific fields [cf. *R.A.M.*, xxii, p. 72].

By calculating regression equations for each plot and comparing the variations by a chi-square test, the data were found to be homogeneous, that is to say, the three equations could be combined to give one regression line, which is useful in determining the probabilities of infection of trees at varying distances from the focus centre and consequently significant in the organization of local control measures.

Of the new infections on the three plots, 75 per cent. were within 100 ft. of the original diseased trees, and 40 per cent. of the elms within 75 ft. of this focus contracted the disorder. The distance of dissemination of the fungus was about twice as long to the north as to the south of the plot centres (50 and 25 ft. respectively, for 50 per cent. infection), this difference being on the verge of significance. Prevalent south winds during beetle (*Scolytus multistriatus*) emergence apparently accounted for the discrepancy.

Felt (E. P.). **Dutch Elm disease control.**—*Sci. Tree Top.*, i, 8, pp. 58–64, 1 fig., 1943.

As a result of the transference of the responsibility for Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xxii, p. 504 *et passim*] control from Federal and State agencies in the older affected areas of the north-eastern United States to municipal authorities and property-owners, the accumulated benefits of the original attempts at eradication are stated to be rapidly disappearing. Local authorities are urged to take cognizance of the implications of this changed policy and make adequate provision for control in order to save thousands of valuable trees, the loss of which would be irreplaceable in the present generation.

Mumenthaler (E.). **Das Ulmensterben in Bern.** [The dying-off of Elms in Berne.] —*Schweiz. Z. Forstw.*, xcv, 2, pp. 50–52, 1 fig., 1944.

During the winter of 1943–4, the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) necessitated the felling of 300 of the 1,096 trees infected by the fungus in the city of Berne out of a total population of 3,116, an operation which had to be performed by skilled workers, and cost the municipal authorities Fr. 75,000. Some of the elms destroyed on account of the disease were over 250 years old. Since its first appearance in the locality in 1929, the pathogen has steadily increased in virulence and all the chemical and mechanical control measures tested for its control have proved unavailing.

Large strips of bark from two of the felled trees, both with about 90 annual rings and a basal diameter of 90 cm., presented the appearance of being peppered with shot holes—the channels of entry of the elm bark beetle (*Scolytus scolytus*),

which in its winged phase conveys the inoculum from tree to tree. Thus, the elms are victims of a combined attack by the beetle and fungus.

Measures directed towards the extermination of the insect would involve the collection and destruction of eggs, larvae, and pupae, and are regarded as quite impracticable. It is possible, however, that repeated spraying with veralin in April and May might save some of the younger trees. The presence of woodpecker holes on the decorticated trunks points to the desirability of more effective protection for insectivorous birds. In the generality of cases the only remedy lies in felling the elms *in situ* and immediately burning the bark. The felled wood is in great demand for cabinet-making and the like.

Rüedi (K.). **Buchenkrankheit im schweizerischen Mittelland.** [Beech disease in the Swiss interior.]—*Schweiz. Z. Forstw.*, xcv, 2, pp. 54–55, 1944.

The contention of H. Leibundgut and Louise Frick that the die-back of beeches in the Swiss interior is primarily attributable to the abnormally rigorous winter of 1939–40 [*R.A.M.*, xxiii, p. 200] is challenged by the writer on the grounds that (a) the disease was already affecting a number of trees in the Zürichberg State Forest in the late autumn and early winter of 1939, and (b) no such consequences followed the even more severe cold of February, 1929, when the thermometer fell to −6·7° C. compared with −5·5° in January, 1940. Thus the question of the part played by the associated fungus [*Nectria coccinea*] assumes greater prominence.

Hepting (G. H.). **Sapstreak, a new killing disease of Sugar Maple.**—*Phytopathology*, xxxiv, 12, pp. 1069–1076, 3 figs., 1944.

'Sapstreak' is the name proposed for a new disease of sugar maples (*Acer saccharum*) in the Pisgah National Forest, North Carolina, where large numbers of trees, 8 in. and upwards in diameter at breast height, have been killed since about 1935 by *Endoconidiophora virescens*, formerly referred to *E. coerulescens* [*R.A.M.*, xxiv, p. 37]. Under the latter name the fungus has been reported as one of the most prevalent agents of sap stain in hardwood and occasionally pine timber in the United States. It invades the healthy sapwood, producing narrow, grey to reddish, radial streaks and water-soaked areas. The foliage of infected trees dwindles and pales progressively, death usually ensuing within two to four years of the first symptoms of crown-thinning. The inoculation of twelve large trees with rye cultures of the pathogen resulted in the death of two and severe infection of four within three years, re-isolations being effected in three cases. Any disease capable of such rapid destruction of 20-in. trees must be deemed of potential significance, and a close watch is being kept on its development in the affected zone.

The fungus is highly variable in culture; an isolate from an inoculated tree grew profusely at first, had a strong, sweetish, musty odour and sporulated freely, but after a year growth was much slower, had less odour, and bore much fewer spores. The hyphae of *E. virescens* are generally confined to the vessels, thus differing from the *Ceratostomella* spp. causing sap stain. Attention is drawn to a peculiar feature of the larger hyphae of *E. virescens*, which branch at some of the septa in the shape of a lyre. The 'lyre joints' have been found in profusion both in diseased maple wood and in sap-stained yellow poplar [*Liriodendron tulipifera*], but they are not mentioned by Lagerberg *et al.* in their description of *E. coerulescens* [ibid., ix, p. 76], nor have they been reported in connexion with other fungi.

Baggchee (K. D.). **Wilt and die back of Shisham, Babul and Khair in the artificial regeneration under agriculture-cum-forestry management.**—*Indian For.*, lxxi, 1, pp. 20–24, 1 pl., 1945.

Babul (*Acacia arabica*) in the irrigated plantations of Lower Sind, where the

trees are under artificial cultivation with cereals and cotton, was observed to be suffering from a similar sequence of pathological symptoms to the wilt and die-back previously reported on shisham (*Dalbergia sissoo*) in the Punjab and khair (*A. catechu*) in the United Provinces. A species of *Fusarium* has been isolated from diseased *D. sissoo* [*R.A.M.*, xvi, p. 146] and *A. arabica* roots, the cambium and sapwood of which show a soft, pinkish-brown rot, sometimes extending as narrow, linear streaks along the main stem, the bark of the sapwood peeling off easily. Inoculation experiments on *D. sissoo* roots in the field resulted in the development of typical wilt symptoms. In the case of *A. arabica*, a fungus of the sclerotial type was isolated jointly with the *Fusarium* and may also be concerned in the etiology of the disease. The organism associated with die-back in the above-mentioned and many other trees is the widespread *Ganoderma lucidum*, sometimes in conjunction with *Polyporus gilvus* and *G. applanatum* [*Fomes applanatus*]. Direct control of the wilt and die-back presents almost insuperable difficulties, and the remedy should therefore be sought in an improved silvicultural technique, since the present method of short rotation appears to be one of the factors predisposing the trees to invasion. Though the symptoms do not become apparent until five or six years after the germination of the seeds, infection probably takes place much earlier. Another disadvantage of frequent cultivation is the change induced thereby in the P_H value of the soil, with its attendant disturbance of the microflora concerned in the supply of nutrients to the trees. Systematic experiments are required to ascertain the optimum interval for rotation.

Schwerdtfeger (F.). **Die wichtigsten forstpathologischen Arbeiten der Jahre 1938 bis 1942. Kritische Übersicht.** [The most important investigations on forest pathology of the years 1938 to 1942. A critical survey.]—*Forstarchiv*, xix, 11–12, pp. 259–272, 1943.

Among the numerous items of interest in this critical survey of German and a few foreign studies on forest pathology covering the period from 1938 to 1942 [cf. *R.A.M.*, xvi, p. 643], the bibliography appended to which comprises 173 titles, the following, excluding those already noticed from other sources, may be mentioned. A. Němec (*Forstw. Zbl.*, lxii, pp. 105–113, 1940) attributes the dying-off of a spruce stand on soil with an exceptionally high degree of exchangeable acidity to an insufficient supply of lime, which the trees unsuccessfully attempted to supplement by drawing on the ampler potash reserves.

A wilt and die-back of spruce shoots caused by *Ascochyta piniperda* [ibid., xviii, p. 219], widespread in Austria, is described by H. Steiner in *Dtsch. Forstw.*, xxii, pp. 353–354, 1940.

The question whether the incidence of decay in a spruce trunk, or the liability to such a condition, can be deduced from the external appearance of an injury, was answered in the affirmative by H. Haufe (*Tharandt. forstl. Jb.*, lxxxix, pp. 100–134, 1938) after the examination of over 1,000 trees.

According to L. Fabricius (*Forstw. Zbl.*, lxii, pp. 262–266, 1940), if less than two-tenths of the spruce crown is spared from invasion by wood-destroying fungi, the trunk should be felled at an early date to obviate further depreciation. As a rule, however, these organisms do not encroach on the bole.

Peace (T. R.). **The occurrence of Melampsora pinitorqua on Scots Pine in south-eastern England.**—*Forestry*, xviii, pp. 47–48, 1944.

Young Scots pine [*Pinus sylvestris*] in limited areas in four places in Kent and Sussex has suffered appreciable damage as a result of infection by *Melampsora pinitorqua* [*R.A.M.*, xxiii, p. 200]. The disease was first noticed in the autumn of 1942 on two patches of about an acre each at Vinehall Forest, near Battle, Sussex, and at Lyminge Forest, between Folkestone and Canterbury, Kent. At Vinehall,

the trees had been planted in 1937, and at Lyminge in 1938. The trees were festooned with dead shoots, and many apparently uninjured shoots bore small cankers. In May, 1943, typical fresh cankers, with rapidly developing caeomata of *M. pinitorqua* appeared abundantly in both localities. The alternate host, *Populus tremula*, was freely mixed with the pine in both areas and in June numerous uredosori were found on the aspen leaves. In both localities the aspens were therefore cut as low as possible in July.

In July, 1943, Scots pine planted in 1939 at Great Sanders, a few miles from Vinehall, was also found to be infected. Both at Vinehall and Lyminge less damage ensued in 1943 than in 1942. In 1944, infection was on a much smaller scale in both areas, and at Great Sanders also the lesions were far fewer. In the same year, the disease was found at Hemsted Forest, Kent, on Scots pine planted in 1941, but was causing much less damage than it had in earlier years. While aspen was abundantly present in the affected areas, it also occurred in places where no disease was present. If the damage had continued on the scale of 1942, the plantation would have become valueless in three or four years.

Balthis (R. F.) & Anderson (D. A.). **Effect of cultivation in a young Slash Pine plantation on the development of Cronartium cankers and forked trees.**—*J. For.*, xlii, 12, pp. 926–927, 1944.

In January, 1940, two adjacent one-acre plots were selected in typical cut-over longleaf pine [*Pinus palustris*] land in Newton County, Texas, in one of which 884 one-year-old slash pines [*P. caribaea*] were planted 6 by 8 ft. and received no further treatment, while the second, similarly planted, was clean-cultivated immediately before and at intervals after planting. In December, 1943, the cultivated trees were superior to the untreated in survival, height, and diameter, but they were also more extensively forked and infected by *Cronartium cerebrum* and *C. fusiforme* [*R.A.M.*, xix, p. 173; xxii, p. 231]. The uncultivated trees showed: percentage survival 88, average height 8 ft., average diameter at breast height of trees over 4½ ft. tall 1·36 in., percentage of trees with forked top 1·5, and percentage of trees with rust 8·6; the corresponding figures for the cultivated plot were 98·1, 11·3, 2·22, 4·6, and 14, respectively. The majority of limb cankers occurred at a height of 2 ft., the highest points of infection on the cultivated and uncultivated plots being 7½ and 4½ ft., respectively. Of 121 rusted trees in the cultivated plot, 112 bore cankers only on the limbs, six on the stem, and three on both, while in the uncultivated, 58 out of 67 were infected on the limbs and 9 on the stem. The higher percentage of infection on the cultivated trees is attributed by P. V. Siggers mainly to the difference in growth rate between the two lots, the cultivated probably producing succulent, susceptible tissue for longer periods than the untreated.

Kimmey (J. W.) & Mielke (K. L.). **Susceptibility to White Pine blister rust of Ribes cereum and some other Ribes associated with Sugar Pine in California.**—*J. For.*, xlii, 10, pp. 752–756, 1944.

A tabulated account is given of experiments carried out in northern California between 1940 and 1942 to determine the relative susceptibility to white pine blister rust (*Cronartium ribicola*) of different forms of *Ribes cereum*, *R. roezli*, *R. tularense*, and *R. montigenum* [cf. *R.A.M.*, xxiii, p. 122 *et passim*]. The Sequoia National Forest form of *R. cereum* may be tentatively rated as resistant, though it is capable of producing appreciable amounts of inoculum under conditions favourable to the rust. Similar considerations apply to the Lassen Park form. Both the foregoing are more susceptible than the forms of *R. cereum* tested in the neighbouring Feather River Meadows, and in British Columbia and Oregon. *R. tularense* and *R. montigenum* may also be provisionally classed as of moderate susceptibility and capacity for teleutospore production. A high degree of variability exists in the

reactions of *R. roezli* in northern California, where its average susceptibility has been found to be lower and its capacity for teleutospore production much greater than indicated by previous tests in British Columbia. The southern form of this species appears to be more susceptible than the northern.

Hobbs (C. H.). **Studies on mineral deficiency in Pine.**—*Plant Physiol.*, xix, 4, pp. 590–602, 4 figs., 4 graphs, 1944.

At Purdue University, Lafayette, Indiana, plants of pitch, red, white, and shortleaf pines (*Pinus rigida*, *P. resinosa*, *P. strobus*, and *P. echinata*) were grown in nutrient sand cultures in earthenware crocks to determine the symptoms and effects on growth of nitrogen, phosphorus, potassium, and magnesium deficiency. Shortage of nitrogen resulted in pallor (a typical symptom of this deficiency in general) and severe stunting in *P. rigida* and *P. echinata*, a destructive tan-coloured necrosis of the needles in *P. strobus*, and a reddening of the tissues in *P. resinosa*. Phosphorus deficiency [*R.A.M.*, xvi, p. 357] was expressed chiefly by stunting and necrosis of the lower needles (very slight in the case of *P. strobus*), sometimes accompanied by a pinkish-red tinge. Lack of potassium [ibid., xix, p. 52] resulted in a bluish-green discoloration of the seedlings and copper-coloured necrosis of the terminals in the rapidly growing *P. rigida* and *P. echinata*, while *P. resinosa* exhibited the former symptom but in this species and in *P. strobus* the necrosis involved the ends of the needles; white pine further showed a marked tendency towards chlorosis. The most prominent feature of magnesium deficiency [loc. cit.] was chlorosis of the needle tips, which subsequently became necrotic, while the discoloration gradually progressed downwards. The lack of this element did not cause such extreme reductions in growth as that of the other minerals.

Spaulding (P.) & Hansbrough (J. R.). **Decay of logging slash in the Northeast.**—*Tech. Bull. U.S. Dep. Agric.* 876, 22 pp., 2 graphs, 1944.

The average periods required for the disintegration of logging slash (the debris left in the forest after cutting) to a point where it no longer constitutes a fire hazard are 15 years for hardwoods, 17 for eastern white pine (*Pinus strobus*) [*R.A.M.*, ix, p. 78], and 29 for red spruce (*Picea rubens*) [*P. rubra*]. Under the conditions most conducive to decay, these periods may be curtailed by about one-fifth. The primary factors governing the activities of the hundreds of slash-decay fungi, of which 50 or so are of primary importance, are moisture, temperature, and the resistance of the wood. Moisture is essential, but since air is also required, the fungi cannot work in completely waterlogged material. They make little or no growth below 40° F. and attain their maximum efficiency at or about 70°. The heartwood of the more durable species, e.g., oak, ash, sugar maple (*Acer saccharum*), red spruce, white pine, Canada hemlock (*Tsuga canadensis*), beech, and birch, decays much more slowly than the sapwood of any.

These factors may be modified by proper silvicultural operations. A short rotation, for instance, results in less slash per acre and a larger proportion of fast-decaying sapwood, with consequent early reduction of the volume to a relatively safe point. Partial cutting is also conducive to rapid decay, while clear cutting tends to retard it by inducing high temperatures and abnormal dryness. Scattered slash usually disintegrates faster than piled or windrowed.

Ogilvie (L.). **Diseases of vegetables.**—*Bull. Minist. Agric., Lond.*, 123, 74 pp., 21 figs., 1944. 1*s.* 6*d.*

The second edition of this very useful bulletin issued originally in 1941 [*R.A.M.*, xxi, p. 59] embodies considerable revision made in the light of recent work and experience. Some 60 pages are devoted to diseases of particular vegetable crops, their symptoms and control, and most of the remainder to control of diseases in

general. The work concludes with indexes of the parasites and the non-parasitic and virus diseases mentioned.

BOSWELL (V. R.). **Disease-resistant and hardy varieties of vegetables.**—*Nat. hort. Mag.*, xxiii, 2, pp. 59–63; 3, pp. 138–143; 4, pp. 203–208, 1944.

One of the first achievements in the breeding of disease-resistant vegetables in the United States dates from 1910, when J. B. Norton began to develop the Mary Washington asparagus variety for resistance to rust [*Puccinia asparagi*]. Other early accomplishments included the selection at the Wisconsin Agricultural Experiment Station of a cabbage (Wisconsin Hollander) resistant to yellows (*Fusarium*) [*conglutinans*] (1916); the production of the first watermelon (Conqueror) resistant to wilt [*F. bulbigenum* var. *niveum*] by workers in the Department of Agriculture (1911); and the crossing at the Virginia Truck Experiment Station about 1920 of a wild Manchurian spinach with Bloomsdale Savoy, the progeny of which combined the resistance to 'blight' [cucumber mosaic virus] of the former with the desirable marketing qualities of the latter, thereby saving the industry from collapse.

Reference has frequently been made in this *Review* to contemporary developments in resistance to bean mosaic and rust [*Uromyces appendiculatus*].

In the second and third instalments of his account, the author presents further information on resistance in cabbage to *Fusarium* [*conglutinans*]; in celery to yellows (*F.*) [spp. including *F. apii*: ibid., xiv, p. 419]; in maize to bacterial wilt [*Xanthomonas stewarti*]; in cucumbers to various diseases, including mosaic and scab [*Cladosporium cucumerinum*]; in muskmelons (the correct American term for the so-called 'cantaloupe') to powdery and downy mildews [*Erysiphe cichoracearum* and *Pseudoperonospora cubensis*] and wilt (*F.*) [*bulbigenum* var. *niveum*], the last-named disease also being discussed in connexion with watermelons. Most of the facts in the report are well known and have repeatedly been referred to in this *Review*, but mention may be made of the following items. In general, early open-pollinated varieties of sweet corn are much more susceptible to bacterial wilt than late ones, among the most important of the former being Early Golden Bantam, Golden Bantam, Golden Early Market, Golden Gem, Golden Sunshine, and Gill Market, while the latter include Country Gentleman, Stowell Evergreen, Howling Mob, and Long Island Beauty. Turning to the hybrids of proved value, Golden Cross Bantam (mid-season) is probably the best known and most widely cultivated, other early to mid-season resistant crosses being Marcross, Spancross, Whipcross, Tendergold, and Top Cross Maine Bantam. Indigold, Purgold, and Ioana are particularly well adapted to the Middle West. Late resistant hybrids include Country Gentleman, 8×6 and 5×10, Hybrid Evergreen, and Bantam Evergreen Hybrid.

Cucumber scab is generally troublesome only in the north-east, where the black-spined variety Maine No. 2 should be grown for pickling. Chinese Long and Tokyo Long Green are commercially undesirable, but are in extensive use as parents on account of their resistance to mosaic and downy mildew.

In 1943, a new cantaloupe of the Hale Best type, Powdery Mildew Resistant No. 5, showing resistance to both races, 1 and 2, of *E. cichoracearum* [ibid., xxii, p. 193], was released and is expected to be planted throughout almost the whole of the Imperial Valley, California, in 1945. Much more serious and widespread than powdery is downy mildew, and hitherto (1944) none of the commercially available varieties has exhibited any noteworthy degree of resistance. Golden Gopher and Iroquois are highly resistant to wilt, the former being particularly suitable to the north-central region, while the old, well-known varieties, Burrell Gem, Paul Rose, and Pollock 10–25 are fairly tolerant of the disease.

Most of the Iowa Agricultural Experiment Station's many wilt-resistant water-

melons have been superseded by Kleckley No. 6 [ibid., xii, p. 269], resembling its parent Kleckley Sweet, and Stone Mountain No. 5 [ibid., xvi, p. 369], both of which are adapted to Middle West conditions. Leesburg, a Florida derivative of Kleckley Sweet, and the Australian Hawkesbury do well in the south, while Klondike R7 has been developed in California for cultivation in the west.

The Marblehead and Long White Bush squashes and some strains of vegetable marrow are resistant to curly top, as are also Big Tom, Cushaw, Large Cheese, and Tennessee Sweet potato pumpkins.

Miller (P. W.) & McWhorter (F. P.). **A disease of Cabbage in western Oregon due to Cercosporella albomaculans.**—Abs. in *Phytopathology*, xxxiv, 10, p. 936, 1944.

The foliage of cabbage grown for seed in Coos and Curry Counties, Oregon, in 1943, was attacked by a *Cercosporella* producing black, dendritic lesions, becoming rounded or rectangular, with well-marked margins, and attaining a diameter of 10 to 20 mm. Wild turnips in the plantings were profusely infected by *C. albomaculans*, cross-inoculation experiments with which on cabbage and reciprocally gave positive results. The disease is uncommon on cabbage, to which it was probably transmitted through natural channels in the case under observation.

Blackford (F. W.). **Black rot and black leg of Cabbage and Cauliflower.**—*Qd agric. J.*, lix, 5, pp. 287–289, 1 fig., 1944.

The disease of cabbage and cauliflower most frequently encountered in Queensland is black rot, due to *Pseudomonas* [*Xanthomonas*] *campestris* [*R.A.M.*, xxiii, p. 283], which is particularly severe in summer-grown cabbages. Both crops are also sometimes affected by blackleg (*Phoma lingam*) [ibid., xxii, p. 234]. Control depends, in the first place, on selecting seed-bed sites on land that has not previously grown cabbages, cauliflowers, or turnips, and is itself at some distance from areas that have produced these crops, or, at least, practising soil disinfection. Seed treatment is also necessary, 30 minutes' immersion in water at 122° F. sufficing to control both diseases. Any affected plants which may appear should be discarded at transplanting. After harvesting, all plant debris should be burnt; any diseased material unavoidably left unburned should be allowed to decompose by planting crucifers only once every three or four years.

Kvícala (B.). **Selective power in virus transmission exhibited by an aphis.**—*Nature, Lond.*, clv, 3928, pp. 174–175, 1945.

In the author's experiments, the aphids *Myzus persicae* and *Brevicoryne brassicae*, when colonized on cauliflower seedlings infected with both cabbage black ringspot [cabbage ring spot] virus and cauliflower mosaic virus, transmitted both, whereas *M. ornatus*, when similarly colonized, transmitted only the cauliflower mosaic virus.

Cameron (A. E.). **Insect and other pests of 1943.**—*Trans. Highl. agric. Soc. Scotl.*, Fifth Ser., lvi, pp. 37–61, 9 figs., 1944.

During an abnormally heavy infestation of crucifers and potatoes in the Lothians in July, 1943, by *Myzus persicae*, neighbouring sugar beet and mangold crops developed virus yellows [*R.A.M.*, xxiii, p. 420], not hitherto recorded in Scotland, the diagnosis of R. Heddle, Advisory Botanist, East of Scotland College of Agriculture, being confirmed by Dr. R. Hull, Midland Agricultural College, Sutton Bonington. The disease was most severe (50 to 100 per cent.) in crops situated within the radius covered by the aphid, and was almost or entirely absent from non-infested districts. In the parts of England where virus yellows is prevalent, it is thought that the beet seed crop may serve as a reservoir of winter inoculum, but in Scotland, where beets are not raised from seed, another

source of infection must be sought, possibly in ground-keeper beets and stored mangolds.

Sereni (Deborah). **Sclerotinia minor on Lettuce and Beans.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 78–95, 1 pl., 1 fig., 1944.

In Palestine, *Sclerotinia minor* was first discovered in 1934; at Rehovoth it has been isolated by various workers from the roots of carnation and *Phlox*, from citrus seedlings, and from potato roots and stems, while the author has found it on broad beans, lettuce, cabbage, tomato, and clover. Affected lettuce has also been found in other parts of Palestine. On this host, the fungus appeared at the base of the leaves and progressed along the midrib. In late stages, the entire root-collar was involved, while in severe cases the leaves became water-soaked and the whole plant melted into a formless mass. Infection was very severe from January to February, 1934, some plants being destroyed in a few days. Broad beans were attacked when the plants had reached a height of 0·5 m., but had not formed pods. The leaves turned black from the tips, shrivelled, and withered, and the stem also became black, blackening and shrivelling starting at the root-collar and spreading upwards; even when the whole stem was affected, the plants, though dry and withered, remained upright.

Isolated from lettuce and beans, the black, irregular sclerotia measured 0·5 to 2 mm. long, and often anastomosed into irregular, flattened bodies several mm. long. Reproduction was purely vegetative. Sclerotia formed, and after a dormancy period germinated and produced mycelium. No apothecia were developed. In culture, microconidiophores measuring 10 to 15 by 4 to 5 μ were formed, bearing round conidia 3 to 4 μ in diameter.

The optimum and maximum growth temperatures were, respectively, 20 to 25° and 30° C. Good growth was obtained on acid and alkaline media, the optimum P_H being 6 to 6·6. During growth, the fungus secreted weak pectinase and a considerable amount of oxalic acid. Germination was more rapid in light than in dark conditions. Sclerotia from soil and diseased plants remained viable for over a year, and displayed strong resistance to dry heat, germinating after exposure to 80° for 30 minutes, 90° for 20 minutes, 100° for ten minutes, and 110° for five minutes. Artificial inoculations in the laboratory and field of lettuce, beans, and potato gave positive results, which also followed inoculations of unwounded fruits of oranges, Clementine mandarins, apples, pears, and bananas. The fungus appeared to be somewhat more susceptible to mercury compounds than to copper sulphate or sulphur.

Olive (L. S.) & Walker (E. A.). **A severe leafspot of Soybean caused by Phyllosticta sojaecola.**—*Plant Dis. Reptr*, xxviii, 37, pp. 1122–1123, 1944. [Mimeographed.]

Soy-bean leaf spot (*Phyllosticta sojaecola*) [*Pleosphaerulina sojaecola*: *R.A.M.*, xviii, p. 292], reported in epidemic proportions in south-western Ontario in the summer of 1943, was found in July, 1944, in several soy-bean fields in Queen Annes and Kent Counties, Maryland. In New Jersey, the disease caused light to moderate infection during August, in two localities.

In Maryland, the fungus appears able to cause severe damage to soy-bean leaves. The spots, situated at the margins or towards the interior of the leaflets, range from 2 to several cm. in diameter. In more advanced infections, the greater part of a leaflet becomes covered with the larger spots. The spots have a dark purple, usually irregular border, surrounding a lighter, brownish inner zone, bearing numerous dark pycnidia. These exude conidia averaging about 8 by 3·2 μ and generally containing two conspicuous oil droplets. As the spot ages, the brownish tissue ruptures and falls out, leaving only the purple border.

Booer (J. R.). **Control of white rot in Onions.**—*Nature, Lond.*, clv, 3930, pp. 241–242, 1945.

During 1943 and 1944, the author obtained promising results in the control of white rot (*Sclerotium cepivorum*) [*R.A.M.*, xxii, p. 422; xxiii, p. 512] on spring-sown James's keeping onions by applying 4 per cent. calomel [mercurous chloride] dust to the seed drill at sowing. For salad onions raised from March sowings, 1 lb. dust per 50 yds. of drill appeared to suffice, but for bulb onions grown from seed 1 lb. per 25 yds. gave better control.

De Figueiredo (E. R.) & Pereira (H. F.). **Uma doença grave da Berinjela causada por Phomopsis vexans.** [A serious Eggplant disease caused by *Phomopsis vexans*.]—*Biológico*, x, 11, pp. 349–352, 1 fig., 1944.

Phomopsis vexans, to which no previous reference could be found in Brazilian phytopathological literature, has been encountered in the eggplant crops along the coast of São Paulo, causing such devastating losses as to render control measures impracticable. Prophylactic methods to be adopted in future should include the planting of resistant varieties, e.g., Florida High Bush or Excelsior, in preference to the susceptible Beauty, and repeated applications of Bordeaux mixture to the growing plants.

A wilt disease of Sunn Hemp in S.A.—*Emg S. Afr.*, xx, 226, p. 30, 1945.

A brief, preliminary account is given of a wilt of *Crotalaria juncea* due to *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [*R.A.M.*, xvii, p. 442], which occurs in several localities in South Africa, notably in the Transvaal and parts of the Cape, and appears to be spreading. Plants in all stages of growth develop rapid wilting and dying. In very young seedlings, the disease has the effect of damping-off; affected plants have a yellowish tinge, often accompanied by a silvery appearance, due to the leaves drooping and curling in so that the under side shows. Later, the leaves become stiff, brown-grey, and dry, dropping off from the base of the plant first. The entire plant may die within three or four days of the appearance of the first symptoms. Sometimes, longitudinal brown streaks may be present on the stems of affected plants, while on dead or dying plants a thick, salmon-pink fungal growth often appears near the base of the stem, extending upwards for several inches. This is the stage most easily recognizable in the field.

In a stand of sunn hemp the disease may at first appear in isolated patches, or it may affect only one or two plants here and there. Spread is uneven, but seems to follow the direction of the flow of rain water and irrigation water. Infection appears to be carried over in the soil. The control measures suggested are a fairly long rotation and the use of a fungicidal dust to protect the seedlings. The disease constitutes a menace to the successful use of the crop for green manuring and other purposes in many areas.

Chowdhury (S.). **Physiology of Cercospora sesami Zimm.**—*J. Indian hort. Soc.*, xxiii, 3, pp. 91–107, 1 pl., 5 figs., 3 graphs, 1944.

Leaf spot of sesame (*Sesamum indicum*), due to *Cercospora sesami* [*R.A.M.*, xxi, p. 427], is stated to have been prevalent for some years in the vicinity of Sylhet, Assam, where it causes considerable damage. The disease also occurs in other parts of Assam, and has been reported from Bombay.

As a rule, the plants are attacked just at or before flowering-time. Light brown spots, 2 to 5 mm. in diameter, appear on both surfaces of the leaves and sometimes coalesce into irregular areas, 5 to 15 mm. in diameter. The colour darkens as conidiophores and conidia form, and the surrounding leaf tissue frequently assumes

a yellowish hue. On the petiole the spots are elongated and of varying lengths, at first light brown, and gradually darkening. Generally, the stem is much less severely affected than the leaves, the spots resembling those on the petiole; sometimes the whole stem dries, and the plant droops. The pods show more or less circular, brown, later black lesions, 1 to 7 mm. in diameter. In advanced stages the pods are often destroyed.

Within the host, the mycelium consists of irregularly septate, thick-walled, light brown hyphae. The light brown conidiophores, which become dark brown when mature, are produced in clusters of 5 to 10, and emerge through the stomata. Generally unbranched, they measure 38·5 to 67·5 by 4 μ, and are mostly 0- to 3-septate. The subhyaline to very light yellowish conidia are 7- to 10-septate, elongated, and tapering towards the apex. They measure 88 to 136 by 3 to 4 μ.

Inoculation tests in the laboratory and the field showed that the fungus can attack every part of the host. Inoculation with mycelium induced infection within 48 hours, and with spores in four to six days.

When the fungus was grown on a large number of artificial media, growth was better on thickly- than on thinly-poured plates, and in alternate light and darkness than in complete darkness or continuous light. It tolerated relative humidities from 50 to 100 per cent., the optimum being 92 per cent. The optimum growth temperature lay between 25° and 30° C. The chief factors influencing zonation in culture were media, alternate light and darkness, and fluctuating temperatures, while sporulation was affected by light, humidity, temperature, media, and wounding. Conidial size and septation were affected by temperature, relative humidity, and media. Mean conidial length was greatest (109·5 μ) at 25° and least (79·5 μ) at 35°. Mean width decreased with rise of temperature, and mean septation was greatest (8) at 25° and least (5) at 35°. The mean length was 102·9 μ at relative humidity 47 per cent., 128·2 μ at 70·4 per cent., and 157·9 μ at 100 per cent., while the mean septations for the same humidities were 8·5, 10·5, and 13, respectively. As regards media, under otherwise identical conditions, the average length of the conidia was greatest (110·9 μ) on *Sesamum* stems, and least (101 μ) on Dox agar, while the average width was the same on Dox and oatmeal agars (3 μ) and slightly more (3·4 μ) on *Sesamum* stems. The optimum P_H concentration for growth was 6·5; no growth occurred at P_H 2·1 to 2·7 or at P_H 8·5.

Smith (K. M.). **Plant viruses.**—*Endeavour*, iv, 13, pp. 22–28, 12 figs. (10 col.), 1945.

This popular paper on plant viruses is noteworthy for the excellent coloured figures showing the wide range of symptoms induced on tobacco, and in one instance on tomato, by various strains of the tobacco mosaic virus.

Report of the Director for the year ending 31 October, 1943.—*Bull. Conn. agric. Exp. Sta.* 477, pp. 52–56, 1 fig., 1944.

In this report [cf. *R.A.M.*, xvi, p. 21] it is stated that Dutch elm disease [*Ceratostomella ulmi*] is becoming more prevalent in south-western Connecticut, probably owing to the cessation of control work by the Federal authorities three years ago. Efforts are at present confined to preventing spread into the eastern half of the State. Protection can be afforded to valuable elms in urban areas by maintaining a disease-free zone round each locality where the trees are present. Recent work indicated that the probability of infection at a distance of 500 ft. from a diseased tree is 1 in 500; while at 1,000 ft. it is only 1 in 10,000.

A new fungicide, disodium ethylene bisdithiocarbamate, is stated to be water-soluble, but when it has dried after being sprayed on to the plant, to be invisible and water-insoluble. Laboratory tests with a synthesized form of juglone, a sub-

stance excreted by walnut roots, proved it to be more strongly fungicidal than copper oxide.

Experimental evidence showed that Bordeaux mixture reduced potato yields by about 25 per cent., the injury being masked by the control of flea-beetles [*Epitrix cucumeris*]. Search for a safer material is being continued, but in the meantime spray damage can be lessened by lowering the proportion of lime to half that of the copper sulphate and using dolomitic instead of hydrated lime.

Burbano (J.) & Ruiz (C.). **Monografia agricola de la Provincia de Imbabura.** [Agricultural monograph of the Province of Imbabura.]—*Bol. Dep. Agric. Ecuador* 26, 119 pp., 11 figs., 2 graphs, 1943.

The following information on plant diseases and their control in the Province of Imbabura, Ecuador, is presented by L. Rodriguez in this monograph. Cereals in general are attacked by black and yellow rusts (*Puccinia graminis* and *P. glumarum*), while brown rust (*P. triticina*) is confined to wheat. *P. maydis* is ordinarily of little economic importance, but in cases of severe infection the rusted maize leaves should be collected and burnt. Wheat is subject to loose smut (*Ustilago tritici*) and bunt (*Tilletia tritici*) [*T. caries*]. Maize smut (*U. maydis*) [*U. zeae*] usually occurs only in a sporadic form, and may be combated by burning the galls from the diseased plants, which should on no account be used as fodder, since passage through the intestinal tract of livestock fails to destroy the viability of the spores.

Potato late and early blights (*Phytophthora infestans* and *Alternaria solani*) are controllable by preventive treatments with 1–1–100 Bordeaux mixture. The elimination of powdery scab (*Spongospora subterranea*) may be effected by eight to ten minutes' immersion of the seed in mercuric chloride (2 lb. 2 oz. in 1,000 l. water), followed by a cold-water rinse. Commercial formalin is also effective. Seed selection is the most efficacious method of eradicating wart disease (*Synchytrium endobioticum*) from the crop.

Moore (W. C.). **Cereal diseases. Their recognition and control.** *Bull. Minist. Agric., Lond.*, 129, 42 pp., 18 figs., 1945. 1*s.* net.

This bulletin gives an excellent semi-popular account of the cereal diseases found in Britain, a few diseases occurring abroad, but not yet recorded in this country, being included.

Sprague (R.). **Rootrots of cereals and grasses in North Dakota.**—*Bull. N. Dak. agric. Exp. Sta.* 332, 35 pp., 8 figs., 1944.

In North Dakota, the root-rot diseases of cereals and grasses may be divided into four main types, viz., pre-emergence seed and seedling rots, damping-off, root-browning or seedling blight, and general root decay or necrosis.

The first is caused by *Pythium debaryanum*, *Helminthosporium sativum*, *Fusarium* species, and various generally weak parasites, such as *Rhizoctonia* [*Corticium*] *solani*, *Curvularia geniculata*, and *Phoma terrestris*. In grasses, pre-emergence rotting due to *Pythium arrhenomanes* [*R.A.M.*, xxi, p. 366] is serious in early autumn seedings, and in mid- to late spring in warm-season grasses or grains. Any of the general root-decay fungi except the weaker *Fusarium* species are capable of causing pre-emergence killing. The loss due to this seed-rotting in North Dakota is greatly under-estimated, and seldom amounts to under 25 per cent. in small grasses.

Damping-off soon after emergence is caused by *Pythium debaryanum* and related species; true damping-off is less common in grasses locally than in certain non-grass crops.

Root-browning or seedling blight, due to *Pythium arrhenomanes*, causes the

seedlings of cool-season grasses to wither and die about six weeks after the April seeding. Warm-season grasses, maize, sorghum, and particularly millet are also affected if seeded early, before the soil is thoroughly warm.

General root decay or necrosis, caused by *H. sativum*, *F. scirpi* var. *acuminatum*, *C. geniculata*, and, to some extent, by *P. debaryanum*, *P. irregulare*, and *P. ultimum*, is a slower process, generally known as 'common root rot'. Injury is not confined to any particular period of growth, though most of it occurs in summer as maturity approaches in cereals, or on grasses past the early seedling stages.

The most important fungal root parasite of grasses in North Dakota is *P. arrhenomanes*, while that of wheat is *H. sativum*. Both infect almost all cereals and grasses. Oats are moderately susceptible to most strains of *P. debaryanum*, *P. ultimum*, and *P. irregulare* causing root necrosis and damping-off, whereas wheat is resistant to nearly all of them. Small-seeded grasses are generally highly susceptible to them if seeded in cool, moist soil. Most of the *Fusarium* species found locally are important only as seed rots in the early season, but *F. graminearum* [*Gibberella zeae*] and *F. culmorum* are sometimes serious on the roots of cereals in the Fargo area. *Corticium solani* is prevalent on cereal and grass roots in wet weather, but most of the strains are not strongly parasitic to most grasses and cereals. It sometimes causes eye spot of wheat stem bases.

Pink root of maturing cereals and grasses is due principally to a non-parasitic development of *F. oxysporum* on dead roots, or to a non- or semi-parasitic infection by *Phoma terrestris*, which is abundantly present in mid- to late summer on cereals and grasses. It is not important, but sometimes rots the seeds of sorghum and maize in wet, retarded, early-season weather.

Several common moulds, such as *Alternaria* species, are non-parasitic on living cereals and grasses. *Curvularia geniculata* possesses strains which cause root decay in some cereals and grasses.

Machacek (J. E.). **The prevalence of Septoria on cereal seed in Canada.**—*Phytopathology*, xxxv, 1, pp. 51–53, 1 fig., 1945.

Septoria nodorum was isolated from a large number of the 6,183 samples of cereal seed-grain collected from all the provinces of Canada from 1939 to 1943, inclusive, the heaviest infection generally occurring in wheat and the lightest in oats, while barley was intermediate. To cite some data from the accompanying table, the mean percentages of infected seeds in the wheat samples from the Maritime Provinces in the five years of the survey were 1·35, 0·00, 17·84, 19·63, and 12·29, respectively, the corresponding figures for oats being 0·20, 0·00, 0·04, 0·03, and 0·05, respectively, and for barley 0·03, 0·25, 1·00, 0·12, and 0·55, respectively. In 1942 and 1943, however, barley from Saskatchewan and Alberta showed higher percentages of infection than wheat (1·88 and 2·34 in the former year and 5·02 and 3·96 in the latter compared with 1·16 and 1·40 and 1·27 and 0·94, respectively), suggesting the possibility of physiologic specialization within the fungus. Some support was lent to this hypothesis by cultural differences between the eastern and western strains, the pycnospores of the latter, for instance, being longer and thicker than those of the former.

Harrar (J. G.), Loegering (W. Q.), & Stakman (E. C.). **Relation of physiologic races of Puccinia graminis tritici to Wheat improvement in southern Mexico.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1002, 1944.

Physiologic races 38, 59, and 19 of *Puccinia graminis tritici* were the only ones revealed by surveys during the past 12 years to be of practical importance in southern Mexico [*R.A.M.*, xix, pp. 10, 463], where races 56 and 17, very prevalent in the north of the country and the United States, are seldom encountered. Marquis, Rival, Newthatch, Regent, Renown, Pilot, and Mida are among the

North American varieties showing virtual freedom from *P. g. tritici* and high resistance to leaf rust [*P. triticina*] in two years' tests under epidemic conditions near Mexico City, but all were two to three weeks later in reaching maturity than certain early, highly susceptible varieties commonly grown in Mexico.

Cartwright (W. B.) & Shands (R. G.). **Wheat varieties resistant to the Hessian fly and their reactions to stem and leaf rusts.**—*Tech. Bull. U.S. Dep. Agric.* 877, 6 pp., 1944.

This is a report on the reactions to the Hessian fly [*Phytophaga destructor*] and stem and leaf rusts [*Puccinia graminis* and *P. triticina*: *R.A.M.*, xxii, p. 294] of certain wheat varieties, the tests with the insect being carried out at Lafayette, Indiana, from 1939 to 1943, and those with the rusts at Madison, Wisconsin, in 1941 and 1942. Spreader rows of susceptible varieties were inoculated with race 56 of *P. graminis* in the former year, and with 19 and 56 in the latter. Natural epidemics of *P. triticina* occurred in each year.

Most of the 92 common wheats were more or less susceptible to both rusts. Five selections from Portugal, Uruguay, and Argentina showed merely traces of leaf rust, and 15 others developed only 5 to 20 per cent. Marquillo and Portugal 90 seemed to be the most resistant to *P. graminis*. The three club wheats were susceptible to both rusts and the 21 durums all highly resistant, six showing only traces of *P. graminis*. Some of the durums combined resistance to the rusts with a similar reaction to the fly, and may therefore be specially useful in breeding programmes.

Cortazar Sagarminaga (R.). **Estudio de la herencia de la resistencia al Puccinia graminis tritici y otros caracteres en los cruzamientos de la variedades de Trigo Sinvalocho × Premier y Sinvalocho × Regent.** [Study of the inheritance of resistance to *Puccinia graminis tritici* and other characters in crosses of the Wheat varieties Sinvalocho × Premier and Sinvalocho × Regent.]—*Agric. tec. Chile*, iv, 1, pp. 88–97, 1 fig., 1 graph, 1944.

In connexion with a project of breeding wheat for resistance to *Puccinia graminis tritici* in Chile [*R.A.M.*, xxii, p. 424], the writer conducted trials at the Minnesota Agricultural Experiment Station, using a mixture of 20 physiologic races of the rust, to determine the mode of inheritance of this character in crosses of Sinvalocho × Premier and Sinvalocho × Regent.

In the latter cross resistance was found to depend on three complementary factors, which are probably also operative in the former, though in this case the aberrant behaviour of two out of the 14 F_2 families raises a doubt as to the correctness of the hypothesis. In Premier × Sinvalocho the characters of date of earing and number of panicles are inherited independently of each other and of reaction to rust, but in Regent × Sinvalocho linkage was observed between resistance to *P. g. tritici* and awn type.

Vallega (J.). **Reacción de algunos Trigos con respecto a los razas fisiológicas de Puccinia rubigo-vera tritici, comunes en Argentina.** [Reaction of certain Wheats with regard to the physiologic races of *Puccinia rubigo-vera tritici* prevalent in Argentina.]—*Rev. Fac. Agron., B. Aires*, xi, 1, pp. 91–115, 1 diag., 1944. [English summary.]

None of the wheat varieties cultivated in Argentina is completely resistant to all the physiologic races of *Puccinia rubigo-vera tritici* [*P. triticina*] occurring in the country [*R.A.M.*, xxi, pp. 187, 518], but Sinvalocho sustains the least damage on account of its strong capacity to withstand attack by the predominant races, 20 and 49. The Previsión 25, Klein 157, Acero, Klein 33, Otto Wulff, and Pampa varieties, which are resistant or only moderately susceptible to most races, do not usually suffer severe injury, but their reactions to race 20 being very variable,

they may, under certain conditions, be heavily infected. The following varieties are resistant to individual races: I.F.L.E. 7d to 20, 49, 5, 57, and 114; Lin Calel to 5, 57, and 114; and Favorito to 62.

Among the old varieties and selections grown in the country, Titan is of special interest as practically immune from all races; Renacimiento and Barleta 10 are attacked only by 62 and 5, respectively; Apulia (Klein's selection) is very resistant to 20, 49, 62, and 5; while some others, including Ardito (Klein), Barleta 25c, Klein 49 and 75, Progreso, Riccio, Sin Rival, and Vencedor, are resistant to the most prevalent races. A new selection, Progreso×Apulia H211 t 140 proved to be resistant to all races of the rust existing in Argentina, and similar observations were made in connexion with lines developed from H3×38 M.A., except for the variable reactions of the latter to race 5. Of the foreign varieties tested, Warden× Hybrid English w 325, Bobin Gaza Bobin, Colorado barbudo [bearded], Corazón [Heart] de Maria, Democrat, H. 1053, Kawvale, Mediterranean, Persia, Axminster, Normandie, and Thew were resistant to one race or more, whereas some North American wheats, such as Mercury, Coronation, Renown, and Hope gave an intermediate response to nearly all the races.

An analysis of different species of *Triticum* showed that all forms belonging to *T. monococcum* and *T. timopheevi* are resistant to brown rust, whereas *T. spelta*, *T. macha*, *T. sphaerococcum*, *T. durum*, *T. diococcum*, *T. turgidum*, *T. polonicum*, *T. persicum*, and *T. pyramidale* comprised forms with quite divergent reactions.

Jamalainen (E. A.). **Über die Steinbrandanfälligkeit verschiedener Weizensorten in Finland.** [On the susceptibility to bunt of different Wheat varieties in Finland.]—*Julk. Valt. Maatalousk.* 115, 27 pp., 1941. [Abs. in *Z. PflKrankh.*, liv, 1–2, pp. 46–47, 1945.]

Wheat bunt is stated to be still fairly prevalent in Finland, where 97 per cent. of the infection is caused by *Tilletia tritici* [*T. caries*] and 3 per cent. by *T. levis* [*T. foetida*: *R.A.M.*, xxiii, p. 338]. All the summer and winter varieties at present under cultivation are more or less susceptible. Of the former group, Diamond and Garnet are heavily infected at a low temperature (8° to 10° C.), but sustain very little damage at a higher range (17° to 19°); hence probably the larger crop reductions in the north than in the south. The divergences in pathogenicity of bunt collections from various localities point to the existence in the country of different physiologic races.

Mundkur (B. B.). **Some rare and new smuts from India.**—*Indian J. agric. Sci.*, xiv, 1, pp. 49–52, 2 figs., 1944.

This descriptive list of 19 species of smuts not before recorded in India, of which seven are proposed as new species and one as a new combination, includes the following items of special interest. *Tilletia caries* and *T. foetida* were found in wheat ovaries at New Delhi, in April, 1941, apparently the first authentic records of these fungi in the Indian plains. The seed from which the crops were raised appears to have come from Baluchistan and to have been infected. Both species have been recorded for Sind, but their occurrence there is doubtful. *Neovossia indica* [ibid., xxiii, p. 338] was found in wheat seed at New Delhi and in the United Provinces in 1942 and in Sind in 1941.

Ustilago tritici was found on wheat leaves in the Central Provinces in January, 1943; this is the first record of the smut for central India.

Briggs (F. N.). **Linkage relations of factors for resistance to mildew in Barley.**—*Genetics*, xxx, 2, pp. 115–118, 1945.

A study at the University of California of the progeny of a cross between Psaknon barley (*Erysiphe graminis*) carrying the Psaknon factor Ml_p for resistance to mildew

[*R.A.M.*, xxii. p. 200], and Selection 175 (Duplex × Atlas), carrying the Duplex factor ml_d for resistance to the disease, showed that these two genes for resistance were linked with a recombination value of 16·38 per cent. They were further found to be linked with the factor pair, normal versus albino (*At at*) which places them in linkage group II, the cross-over percentages for the Duplex and Psaknon genes being 12·08 and 36·65, respectively. The gene order indicated is *at*, ml_d, Ml_p.

McLaughlin (J. H.). **Southern Cooperative Corn Disease Research Committee Report for 1944.**—*Plant Dis. Reptr, Suppl.* 153, pp. 18-29, 6 figs., 1945. [Mimeographed.]

In 14 tests conducted in South Carolina, Georgia, and Oklahoma in 1944, the emergence of maize seed heavily infected by *Fusarium moniliforme* [*Gibberella fujikuroi*] and to a lesser extent by *Rhizopus* and *Penicillium* spp. was significantly improved by treatment with semesan jr., spergon, barbak C, and Dubay 1452-F at a dosage of 1½ oz. per bush., the mean increases obtained with which at all locations amounted to 5·21, 5·51, 5·95, and 5·17 per cent., respectively, over the controls. In eight of the trials highly significant stand increases resulted from the use of any one of the above-mentioned four chemicals. Late as well as early plantings benefited from seed treatment. In general, no appreciable differences in emergence resulted from variations in the prescribed rates of application of the fungicides.

Brichet (J.). **Une maladie redoutable qui se répand dans nos Orangeries. La 'psorose' (scaly-bark) des Américains.** [A serious disease that is spreading in our Orange groves. 'Psorosis' (scaly-bark) of the Americans.]—*Fruits & Primeurs*, xiv, 153, pp. 228–230, 1944.

In 1930, the author observed some hundreds of Thomson's Navel orange trees in an orchard at Arba, Algeria, affected by psorosis [*R.A.M.*, xxiv, pp. 56, 98]. Since then, the disease has been noticed in numerous plantations in Algeria. The author has never found young branches to be attacked. The condition is most prevalent in the relatively moist coastal districts, and is much rarer in the hot, dry plains: the most vigorous trees appear to be as susceptible as the weakest. Sweet orange varieties (*Citrus sinensis*), including Washington's Navel, Thomson's Navel, and the Valencia late orange, are the most susceptible, but no infection has so far been observed on the Mediterranean varieties at present grown in north Africa, i.e., Portuguese, ordinary Valencia, Maltese, and local varieties derived from these. Mandarin orange and pomelo are resistant but *C. bigaradia* and rough lemon are susceptible.

The spread of the disease, which appears to be advancing with increasing rapidity, is attributed to the planting of susceptible American varieties, large-scale budding from affected trees, and careless methods of pruning. The paper concludes with an outline of the usual control methods.

Bliss (D. E.). **Controlling Armillaria root rot in Citrus.**—7 pp., 8 figs., California Agricultural Experiment Station, 1944. [Mimeoprint.]

In controlling citrus root rot due to *Armillaria mellea* [*R.A.M.*, xxiii, p. 296], which at present is causing widespread concern in southern California, all trees in and about the orchard should be examined once a year. Growers should know the history of their land, and the position of former washes, creeks, and native trees, all of which are potential sources of infection. Dead stumps should be regarded with suspicion, as should areas where the trees are sickly or have died. Windbreaks, roadside trees, and ornamentals are all liable to infection, the disease spreading rapidly through the roots of such plants when the tops are removed. A good map should be made to assist in the survey, large enough to show the position of every tree. Individual blocks, rows, and trees should be numbered, and the

disease situation indicated in detail by symbols. The map can be altered as required, or a new one made for each survey.

After the visibly affected trees have been located, the outer limits of the infestation must be determined. The crown roots of all apparently healthy trees adjacent to infected trees should be examined. If the fungus has not reached the trunk, a shallow test trench should be made midway between the two trees at right angles to a line joining them. The condition of the roots in this trench will indicate roughly how far the disease has spread and whether the apparently healthy tree can be protected. The roots of other apparently healthy trees about the edge of the affected area should be similarly inspected.

When all this preliminary information has been plotted on the map, one or more centres of infection may be found. A continuous trench should then be dug round each infected area, 4 to 5 ft. deep and wide enough for a man to work in. The trench area should include all affected and suspected trees. As an extra precaution, a whole row of healthy or apparently healthy trees may be left between the trench and the infected area. The trench should run half-way between the tree trunks, and all the earth dug up should be thrown towards the infected area.

When citrus orchards are being planted, the most practical means of control is to plant healthy nursery stock in uninfected soil. As tree roots of all kinds appear to become more susceptible to infection after removal of the tree tops, it is safer to retain a living infected tree in or near an orchard than to cut away the top without destroying the roots. The sporophores should be destroyed before the spores are discharged. Flood water should not be allowed to pass through the orchard. Trees on the banks of streams are liable to become infected through piles of trash in the bed, and willows and poplars planted along streams against soil erosion are also very susceptible.

To prevent further spread from an infected area, the continuous trench made round it should be converted into a chemical barrier. Carbon disulphide should be placed in a single line of charges along the bottom at the rate of 2 liquid oz. every 18 in. in holes 8 in. deep. The soil over each charge should be tamped at once, to prevent the escape of fumes. The trench should then be filled with the excavated soil, which should be compacted by tamping, but not watered. Carbon disulphide should then be applied in a single line of charges along the top of the filled trench at the same rate as in the trench. The soil over each charge should be tamped immediately, while that over the trench and to a distance of 2 ft. on both sides should be moistened with water to a depth of 3 in. Later, at intervals of six months, preferably when the soil is dry, carbon disulphide should be applied as before in a single line of charges along the chemical trench. The line of chemical treatment should coincide with the middle of the trench and should be accurately marked on the map.

To treat the disease, a pit may be dug about the root crown of each infected tree and left open indefinitely. Surgery may be resorted to in the early stages, the wounds painted, and the diseased wood destroyed.

To eradicate the fungus from affected soil, the affected trees should be pulled out with as many roots as possible, all roots over 2 in. in diameter being removed. The soil should be levelled, smoothed down, and left to dry. Carbon disulphide should then be applied over the whole area of the tree square or to the skirts of the adjoining trees at the rate of 2 liquid oz. per charge every 18 in. in rows 18 in. apart, in a triangular or diamond-shaped pattern. In sandy soil the charges should be 8 in. deep, and in a clay loam 6 in. Four charges should be applied about the place where the diseased tree stood, at 6 liquid oz. per charge, 4 ft. apart, and 4 to 6 ft. deep. The soil should be tamped over each charge and the soil over the whole treated area should be moistened with water to a depth of 3 in., this blanket of wet soil being maintained for three weeks. The surface should be raked if cracking

appears. A large canvas or glue-coated paper may be substituted for the water seal. The soil should then be allowed to dry, or the cover removed, and replanting carried out when all odour of the gas has disappeared.

Marchionatto (J. B.). **La podredumbre de la raicilla del Naranjo.** [Orange rootlet rot.] [*Publ.*] *Minist. Agric. B. Aires*, Ser. A. i, 1, 15 pp., 5 figs., 1945. [English summary.]

The literature on orange rootlet rot in Argentina [*R.A.M.*, xxiv, p. 98] is briefly summarized and discussed. The conclusion now reached is that the disease is due to infestation by the nematode, *Tylenchulus semipenetrans*, of trees grafted on sour orange stocks in infertile soils. At the moment the most hopeful prospect of control lies in the use of more compatible stocks, such as sweet lime or rough lemon, and the enrichment of the soil with nitrogen-, phosphorus-, and calcium-containing fertilizers.

Weber (G. F.). **The blight disease of Cycas revoluta.**—*Proc. Fla Acad. Sci.*, vii, 2–3, pp. 129–132, 1 pl., 1944.

The first symptoms of the so-called 'blight' of *Cycas revoluta*, which has been under observation for over a decade in Florida, are pale green, sunken, rather shrivelled, rapidly expanding marginal areas, with the centres on the pinnae of the young leaves. The tissues along the outer margin shrink, and the pinnae are frequently curled or bent out of their characteristic flat plane, ultimately dying back to half or three-quarters of their length, or almost as far as the leaf rachis. These extreme features are not observed when the leaves are fully expanded before the onset of the disease, in which case the lesions often develop a brown or reddish-brown border and do not spread to any extent. Among the fungi isolated from blighted palms during the course of the studies were species of *Botrytis*, *Cladosporium*, *Alternaria*, *Diaporthe*, *Helminthosporium*, *Fusarium*, *Glomerella*, *Phoma*, *Macrophoma*, and *Pestalozzia*, most of which were inoculated into *Cycas revoluta* with negative results. The blight, which is most destructive in the Gainesville district in May and June, seems to be systemic and perennial, increasing annually in severity until the host dies. Diseased plants have not been observed to recover or produce a healthy whorl of leaves. Eradication of blighted plants as soon as the condition becomes apparent is the only control measure that can be suggested at present.

Dastur (R. H.) & Singh (M.). **Studies in the periodic partial failures of the Punjab-American Cottons in the Punjab. X. The interrelation of sowing-date, nitrogen, water-supply, and spacing on growth and yield of 4–F Cotton.** —*Indian J. agric. Sci.*, xiv, 1, pp. 18–29, 1944.

Further studies on the factors affecting the incidence of 'tirak' in American cottons in the Punjab [*R.A.M.*, xxiii, p. 484] demonstrated that when cotton was sown on 12th May, 2nd June, and 22nd June, 1939, there was a steady increase in setting percentage and in the boll weight with delay in sowing. These tendencies raised the yield status of later sowings under unmanured conditions.

The dominating effect of nitrogen on growth, amelioration of 'tirak', and improvement of yield was clearly established. The beneficial effects of nitrogen on the dry weight, weight of seed cotton per boll, and on yield diminished as sowing was deferred. Increase in boll number with nitrogen application was less marked in the third sowing than in the first two.

The evidence indicated that in the first two sowings it made no difference whether the plants were widely or closely spaced, but that in the final sowing close spacing was essential in order to counteract the depression in boll number. The response to water was low and did not interact with any other factor.

[A popular account of this work appears in *Indian Fmg*, v, 6, pp. 254–258, 1944.]

Prasad (N.). **Studies on the root rot of Cotton in Sind, 1.**—*Indian J. agric. Sci.*, xiv, 1, pp. 40–43, 1944.

Investigations carried out in Sind into cotton root rot, which occurs every year in the province and causes considerable damage to the crop, infection generally ranging from 5 to 10, but sometimes reaching 60 per cent., showed that the first visible symptom is a complete wilting of the plant. The affected cotton can easily be pulled out of the soil, nearly all the lateral roots being destroyed. When the roots are squeezed, a yellow liquid oozes out. The cortical tissues of the root become fibrous, and the central woody portion turns brown or, in severe cases, black. In Gujerat, the disease appears after the flowers have formed, while in the Punjab it occurs when the plants are two months old. In Sind, however, it attacks plants only 15 days old, and continues up to the boll formation stage.

Over 700 isolations were made from affected material from different places. Saprophytes were disregarded, and the rest of the isolates (*Fusarium* and *Rhizoctonia*) were arranged in seven different groups, based on kind of aerial mycelium (whitish, pinkish, scanty, &c.), discoloration of the medium (light brown, dark brown, &c.), and spore-bearing structures (none, sclerotia abundant, and sclerotia not abundant). Inoculum of the seven types was prepared by growing the fungi in Erlenmeyer flasks on a sterilized mixture of 190 gm. soil and 10 gm. wheat flour. To every 200 gm. of mixture 60 c.c. of water was added. Three weeks later, 12 in. pots were two-thirds filled with sterilized soil, half the contents of each flask were sprinkled over the soil, and six cotton seeds were placed on the inoculum. The seeds were then covered with the rest of the inoculum, which in turn was covered with sterilized soil. Four pots were used for each type. In the controls, the seeds were sown between two layers of sterilized soil and wheat flour.

Twenty days after sowing, wilt developed in the pots inoculated with type 3 (*Rhizoctonia*). In about a week nearly all the plants in this series died. Two days after the first wilting appeared, plants began to die in the pots inoculated with types 1 (*Fusarium*) and 5 (*Rhizoctonia*). Isolations from the affected plants in all cases gave fungi identical with those with which they had been inoculated. This experiment demonstrates that a type of *Fusarium* and two types of *Rhizoctonia* are capable of causing a disease in cotton similar to root rot as seen in nature. It also showed that the parasitic isolates were those which appeared most frequently when the isolations were made. Isolate type 1 caused 24 per cent. rotting, type 3 31·8 per cent., and type 5 16·7 per cent. The symptoms produced by *Fusarium* and *Rhizoctonia* resembled each other in all essential characteristics. The chief difference was that the discoloration produced by *Rhizoctonia* was very much darker than that due to *Fusarium*.

A second experiment showed that the *Fusarium* (type 1) and the *Rhizoctonia* (type 3) were more strongly parasitic together than singly. Together, they induced infection much earlier than singly, and the number of plants attacked was much greater. The percentages of rotting caused by the *Fusarium* alone, $\frac{1}{4}$ *Fusarium*+$\frac{3}{4}$ *Rhizoctonia*, $\frac{1}{2}$ *Fusarium*+$\frac{1}{2}$ *Rhizoctonia*, $\frac{3}{4}$ *Fusarium* +$\frac{1}{4}$ *Rhizoctonia*, and *Rhizoctonia* alone were, respectively, 19, 27·3, 80, 26·3, and 26. The symptoms produced by *Rhizoctonia* and *Fusarium* combined closely resembled those due to *Rhizoctonia* alone. Root discoloration was much more intense, and the colour varied from dark brown to black, being deepest at the collar.

Isolates 3 and 5 were tentatively identified as *R. bataticola* [*Macrophomina phaseoli*], while isolate 1 was referred to *F. caeruleum* [though the reported presence of masses of microconidia does not fit this species]. During the investigation, *R.* [*Corticium*] *solani*, the cause of cotton root rot in the Punjab, was not isolated. The present work confirms the view that *M. phaseoli* is the chief agent of cotton root rot in India and also shows that the *F.* sp. is an important cause of the disease in Sind.

Bremer (H.). **Keimlingskrankheiten der Baumwolle in Südwest-Anatolien.** [Seedling diseases of Cotton in south-west Anatolia.] —*Istanbul. Schr.* 4, 25 pp., 3 figs., 1943. [Received February, 1945.]

Following up Forsteneichner's studies on cotton seedling diseases in the Adana region of Turkey in 1929 [*R.A.M.*, x, p. 788], the writer extended similar investigations to eleven other centres of cultivation in different parts of western Anatolia.

From preliminary data it appeared very probable that parasitic agents do not play a decisive part in the development of cotton seedling diseases, which are primarily due to weakness incidental to adverse environmental conditions. In a series of experiments designed to verify this hypothesis, Bornova seed was sown in tin flats on six dates from January to July in 1939 at mean temperatures of 16°, 17°, 19°, 22°, 24°, and 32° C., respectively. Half the flats were sterilized with formalin, filled with sterilized soil, and watered with boiled water, and half the seed was dusted with ceresan (400 gm. per 100 kg.); in half the containers the soil was maintained in a moderately moist condition (50 per cent. of the water-holding capacity, and in the remainder in an extremely humid state (75 or up to 80 per cent.). Except at the minimum and approaching the maximum temperature, seed treatment with ceresan noticeably increased germination, especially in unsterilized soil: in the former case the deleterious effects of cold were too powerful to be counteracted by the precaution, and in the latter, the already high germinative capacity of the seed rendered further treatment superfluous. In sterilized soil the increase in germination was already apparent at 19°, whereas in untreated no comparable effect was observed until a temperature of 24° was reached. Evidently, dusting with ceresan not only eliminates the organisms actually adhering to the seed, but also acts as a local soil disinfectant. In connexion with these tests, it is worthy of note that ceresan treatment somewhat retarded cotyledonary development; there were, however, no permanent ill effects.

Further support was lent to the view that the fungal infection of cotton is secondary to injury of physiological origin by the microscopic detection of a diffuse brown discoloration, extending from the hypocotyl-root borderline more or less all over the underground system and obviously of external origin, since the inner layers were sound until saprophytic or facultative parasites gained ingress through the damaged tissues. Predominant among the invaders were *Rhizoctonia* sp. and bacteria, of which the former was usually associated with sharply delineated, sunken, constricted lesions and the latter with generalized decay. In most cases, however, both agents were present and the symptom-complexes frequently overlapped. *Rhizopus*, *Fusarium*, and *Alternaria* spp. were of less frequent occurrence and presumably of minor importance in the etiology of seedling rots.

In greenhouse and field seed treatment trials in 1938 and 1939 the relative value of ceresan solution and dust, Gassner's copper sulphate-ammonia solution, delinting with concentrated sulphuric acid, and dusting with caustic lime was compared. Ceresan gave the best results in the field, but it failed to counteract the damage inflicted by a dry spell in 1939, and even in plots where germination was powerfully stimulated the treatment did not prove to be economically advantageous.

Morquer (R.) & Nysterakis (F.). **Le Fusarium lateritium, champignon parasite du Phylloxera vitifoliae.** [*Fusarium lateritium*, a fungus parasitic on *Phylloxera vitifoliae*.]—*C.R. Soc. Biol., Paris*, cxxxviii, 3–4, pp. 75–76, 1944.

In July, 1940, the writers observed on the galls on leaves of Riparia vines at the Toulouse Agricultural Institute dead individuals of *Phylloxera vitifoliae* from which they isolated in pure culture a fungus with hyphae ranging from 2·5 to 7 μ, average 3 to 4·5 μ, in diameter, fusiform, arcuate, uniseptate microconidia, and predominantly tri- to quinqueseptate, falciform macroconidia, 27 to 48 by 3 to 5 μ. These

characters agree with those of *Fusarium lateritium*. Since the fungus was present on the vine foliage even during intervals between *Phylloxera* invasions, the vine would appear to serve as a natural substratum for the saprophytic phase of the fungus, which becomes parasitic with the advent of the zoocecidia. When an aqueous suspension of *F. lateritium* was sprayed on the infested leaves, a mortality of 40 per cent. of the larvae and adults resulted, while the figure attained in the natural epidemic was 60 per cent.

Schwarting (A. E.) & Hiner (L. D.). **A study of domestic ergot of Wheat and Rye.**—*J. Amer. pharm. Ass.*, Sci. Ed., xxxiv, 1, pp. 11–16, 6 figs., 1945.

The following conclusions were reached on the basis of data collected from a systematic investigation of ergot (*Claviceps purpurea*) on samples from rye and wheat in South Dakota, Minnesota, and Ohio from 1940 to 1943 [cf. *R.A.M.*, xxiii, p. 132]. Structural variations between the ergots of the two crops are limited to compactness of the pseudoparenchyma. Ergot of rye is more deeply fissured than that of wheat. Chemical assay methods indicate that the indigenous products compare favourably with Spanish and Russian samples, the rye ergot being slightly higher in alkaloidal content and exhibiting a stronger potency than that of wheat. The native ergots were also shown by biological assay methods to meet official standards. The prevalent climatic conditions of central Ohio are conducive to natural infection of rye, wheat, and other grasses, but artificial inoculation in the field was found to increase the incidence of attack on rye and the yield of ergot. The practical utility of this method, however, can only be determined by large-scale operations over a protracted period with appropriate controls.

McGillivray (W. A.) & Metcalf (W. S.). **The chemical assay of the alkaloids of ergot. I. Total alkaloids in single sclerotia and bulk samples. II. A micro-method for estimation of ergometrine in a mixture of ergometrine and ergotoxine. III. The nature of the colour reaction with *p*-dimethylamino benzaldehyde.**—*N.Z. J. Sci. Tech.*, B, xxv, 3, pp. 115–128, 5 graphs, 1943.

A rapid and accurate method for the estimation of total alkaloids in single sclerotia and bulk samples of New Zealand ergot [*Claviceps purpurea*: *R.A.M.*, xxiv, p. 57] is described. The alkaloids are extracted by cold ammoniacal acetone, transferred to aqueous solution, and measured colorimetrically with the aid of a photo-electric absorptiometer. A method is also given for the estimation of ergometrine and ergotoxine in the absence of comparable amounts of other ergot alkaloids in single sclerotia and bulk samples of ergot.

Muskett (A. E.) & Colhoun (J.). **Foot rot (Phoma sp.) of Flax.**—*Nature, Lond.*, clv, 3934, pp. 367–368, 1 fig., 1945.

Of recent years evidence has accumulated that the flax foot rot pathogen (*Phoma* sp.), first recorded in Ireland by Pethybridge *et al.* in 1921 [*R.A.M.*, i, p. 175] and responsible for an epidemic outbreak in Northern Ireland, Scotland, and Wales in 1944, is seed-borne, and to test the possibility of its control by seed disinfection, numerous laboratory experiments were carried out by the method already described in connexion with *Colletotrichum linicola* and *Polyspora lini* [ibid., xxii, p. 358] with the following results. Nomersan, so effective against the two last-named fungi [ibid., xx, p. 535], was less satisfactory in the *Phoma* trials, giving about 50 per cent. control when used at the rate of 12 oz. per cent. seed. The short wet process, using an 8 per cent. solution of ceresan U. 564 (0·9 gal. per cwt.), though superior to nomersan, was still not altogether efficacious, but arasan and new improved ceresan appear to be very promising for the object in view, the former reducing the incidence of infection from 32·6 to 10·8 and 14·5 per cent. at dosages of 12 and 9 oz. per cwt., respectively, while the comparable figures for the

latter were 2 and 5·5 per cent., respectively. New improved ceresan seems to be more directly toxic to the fungus than arasan, which exerts an inhibitory action on its growth necessitating the prolongation of the tests from seven to twelve days.

Schuster (M. L.) & Anderson (E. J.). **Seedling blight and root rot of Flax in Washington.** —Abs. in *Phytopathology*, xxxiv, 12, p. 1011, 1944.

Seed-coat injury from threshing and infection by soil-borne fungi resulted in poor flax stands in Washington, the incidence of damaged seed in the samples examined ranging from 10 to 15 per cent. in Zenith and Redwing to 65 to 75 in Viking and Bison. In greenhouse tests, hand-threshed seed produced better stands than that threshed by machine at medium-cylinder speed, while the use of high-cylinder speed for the operation caused the heaviest losses. *Fusarium oxysporum* was the fungus most frequently isolated from the diseased material, and inoculation experiments showed it to be a virulent pathogen and the principal agent of reduction in the flax crops of the State, some of the decrease, however, being attributable to saprophytes, such as *Alternaria* and *Penicillium*. Seed treatment with spergon, new improved ceresan, Dubay 1205 FF (50 per cent. tetramethyl thiuramdisulphide), and semesan conferred efficient protection against fungal damage, especially in the case of machine-threshed seed, in greenhouse experiments, and the first three also in the field.

Laurie (A.) & Ries (V. H.). **Floriculture. Fundamentals and practices.** —vi+ 496 pp., 35 figs., 31 diags., 1 col. map. New York & London, McGraw Hill Book Co. Inc., 1942. $4.00. [Received March, 1945.]

Included in this useful manual on the theoretical and practical aspects of the cultivation of ornamentals are numerous items of phytopathological interest, including a tabulated section on pests and diseases and their control.

Marchionatto (J. B.). **Enfermedades del Gladiolo y del Tulipan.** [*Gladiolus* and Tulip diseases.]—*Suelo argent.*, iv, 37, pp. 51–61, 1 fig., 1945.

Descriptive notes, with recommendations for control, are given on two diseases of *Gladiolus*, viz., scab, stem rot, or neck rot (*Bacterium marginatum*) and hard rot (*Septoria gladioli*) [*R.A.M.*, xxii, p. 154], and on tulip blight (*Botrytis tulipae*), all present and the two first-named troublesome in Argentina.

Jones (L. K.). **Mosaic, streak, and yellows of Carnation.** —*Phytopathology*, xxxv, 1, pp. 37–46, 1 fig., 1945.

Creager's substitution of the name 'mosaic' [*R.A.M.*, xxiii, p. 19] for that of 'yellows' as a designation of the carnation disease originally described by Peltier (*Proc. Amer. Carnation Soc.*, xxv, pp. 29–35, 1916) is considered to be misleading, since it is apparent from the description and figures in the first-mentioned paper that both workers were studying the same condition.

Carnation viruses have been under observation in Washington since 1930, and in 1937 they were made the object of intensive investigations, which have shown that two viruses, mosaic and streak, are combined in the yellows disease. The former is expressed by foliar mottling with pale and dark green areas and slight breaking in the flowers of coloured varieties; though generally present in commercial sorts, it is of little economic importance. Streak is characterized by yellowish to reddish streaks and spots on the leaves, sometimes causing the death of portions of the plants. It does not occur alone in commercial culture, but combines with mosaic to produce the virulent complex known as yellows, which has been very injurious to many varieties.

The mosaic virus is readily transmissible by mechanical inoculation but not by *Myzus persicae* or *Thrips tabaci*, has a minimum incubation period of 22 days, and

is inactivated by exposure to a temperature of near 60° C. and after 42 days *in vitro*. Streak is communicable by *M. persicae* but not by *T. tabaci* or mechanical inoculation, and its minimum incubation period is 25 days.

During the period 1941–4 a number of standard carnation varieties, namely, Betty Lou, Camelia, Chief Kokomo, Gardenia, Giant Laddie, Melrose, Patrician, Puritan, and Purity, were discarded from commercial greenhouses largely owing to reduction of quality and yield through yellows. Two varieties showing a high degree of resistance over the same period were John Briry and Matchless. Seedling plants raised from seed of English and French origin in 1938–9 and crossed with commercial Washington varieties from 1938–40 gave rise to 1,038 seedlings, none of which gave any indication of infection by mosaic or streak. In inoculation experiments by grafting on clones from 25 of the most promising seedlings, there were no cases of immunity but considerable differences in the extent of the damage were noted on the affected plants. Two semi-resistant, dark rose-pink varieties, named Victoria and Genevieve, have been developed from this material and are under observation in commercial greenhouses.

Environmental conditions play an important part in the manifestation of yellows symptoms, which may be intensified by factors tending to check plant growth, such as excess watering, nutritional deficiencies, and a superabundance of salt in the soil. Aphid control is the most effective method of reducing losses from yellows. Stringent selection of sound planting stock should be practised from the time the cuttings are removed from the sand until benching.

Walsh (T.). **Susceptibility of grasses to manganese deficiency.**—*Nature, Lond.*, clv, 3936, pp. 429–430, 1945.

After pointing out that hitherto it has been generally considered that grass is much less susceptible to manganese deficiency than oats and certain other crops, the author describes experiments which showed that different grasses react differently to manganese deficiency, that this effect applies to different strains of at least one grass, and that, depending on the species and strain (e.g., perennial and Italian rye grass [*Lolium perenne* and *L. multiflorum*] and cocksfoot [*Dactylis glomerata*], some grasses are almost as sensitive to manganese deficiency as the more sensitive oat and wheat varieties, and much more so than the least sensitive of these.

Keil (H. L.). **New fungicide developments for turf.**—*Greenk. Reptr.*, xii, 6, pp. 5–6, 1944.

During the past two years a number of new organic compounds showing promise in laboratory trials were tested in the field at the Rhode Island Agricultural Experiment Station for their value in the control of dollar spot (*Sclerotinia homoeocarpa*) and large brown patch (*Corticium vagum* = *Rhizoctonia solani*) [*C. solani*] on creeping bent grass [*Agrostis stolonifera*: *R.A.M.*, xxiii, p. 111]. In 1944, ten applications were made between 1st June and 31st August at ten-day intervals. By 21st August the incidence of the two diseases amounted to 39 per cent. and by 26th September to 55. Calo-clor (2 : 1 mercurous chloride and mercuric chloride) [ibid., xxiii, p. 491], 10 gals. per 1,000 sq. ft., was a very effective fungicide but caused considerable injury to the turf at least 25 per cent. by 21st August. Isothan DL (dimethyl dilauryl ammonium chloride), 1·20 gals., also gave a very high degree of control and was less detrimental to the grass than calo-clor, while outstandingly good results without deleterious effects were achieved in the plots treated at the same rate with puratized N5D (phenyl mercuric triethanol ammonium lactate) [ibid., xxiv, p. 138].

Burton (G. W.). **A technic for measuring ergot resistance in Paspalum species.** – *J. Amer. Soc. Agron.*, xxxvii, 2, pp. 160–162, 1945.

Dallis grass (*Paspalum dilatatum*), which is extensively used in improved pastures in the south-eastern United States, is highly susceptible to ergot (*Claviceps paspali*) [*R.A.M.*, xxi, p. 22], and little progress has hitherto been made in the development of resistant selections owing to the lack of a satisfactory technique for measuring differences in the incidence of infection in individual strains of the host. The following method has now been devised and applied at the Georgia Coastal Plain Experiment Station to the analysis of ergot content in over 1,000 seed lots of *P. dilatatum*. When dry enough, each lot was threshed, screened, and placed in a labelled coin envelope. From each sample 100 heavy florets were taken and placed in 16-mm. test tubes. When 20 of these had been prepared, about 14 c.c. technical 66° sulphuric acid was added to each tube and all were shaken for 35 minutes. The caryopses and ergots in the tubes were then washed into beakers of water, separated by pouring the contents through a fine-mesh screen, and spread out to dry on labelled paper towels. When dry, the remnants of the lemma and palea were removed by light rubbing and blowing (*J. Amer. Soc. Agron.*, xxx, pp. 446–448, 1938), after which the caryopses could readily be separated from the dark, irregularly shaped ergots and counted. These counts, subtracted from 100, gave the percentage of ergotized florets in each sample. Two men counting seed while the samples were shaking and drying were able to analyse 10 to 12 samples per man hour, or nearly double the number that could be dealt with by the old method of floret dissection.

A statistical analysis of the results of this study revealed significant differences between strains of *P. dilatatum* which had appeared to be equally susceptible to *C. paspali*. The mean ergot percentages for the 24 strains (each mean the average of the ergot analyses of 40 plants) ranged from 25·9 to 70·4, a mean difference of 7·5 per cent. being required for P = 0·05.

The technique has been applied with equal success to the determination of ergot resistance in *P. notatum* and several hybrids, but the length of the acid treatment must be modified in accordance with the thickness of the lemma and palea. The thick-glumed florets of common Bahia, for instance, must be scarified for 45 to 60 minutes, while less than half this period is necessary for lemma and palea removal in some of the thin-glumed species.

Hardison (J. R.). **Specialization of pathogenicity in Erysiphe graminis on Poa and its relation to Bluegrass improvement.** *Phytopathology*, xxxv, 1, pp. 62–71, 1945.

Selected groups of 398 accessions of 116 species and eight varieties of grasses in 28 genera were inoculated at the Kentucky Agricultural Experiment Station with five cultures of *Erysiphe graminis* isolated from *Poa pratensis* (Michigan, North Dakota, and Kentucky), *P. ampla*, and *P. palustris* (both State of Washington) [*R.A.M.*, xxiii, p. 231]. Each of the cultures was found to be pathogenically distinct, this constituting the first record of pathogenic specialization in *E. graminis* from *Poa*. Three of the cultures infected grasses outside the genus *Poa*, viz., (1) and (21) from *P. pratensis*, of which the former attacked *Deschampsia caespitosa*, *Festuca rubra* and its var. *commutata*, *Koeleria cristata*, *Phalaris arundinacea*, and *Phleum pratense*, and the latter *Beckmannia syzigachne*, *D. danthonoides*, *F. idahoensis*, *F. octoflora*, *F. rubra* var. *commutata*, *K. cristata*, *P. pratense*, *Pucciniella distans*, *Trisetum flavescens*, and *T. spicatum*, and (22) pathogenic to *D. danthonoides*, *F. occidentalis*, *F. octoflora*, *F. thurberi*, *K. cristata*, and *P. distans*.

Several species of *Poa*, both economic and wild, were highly resistant to all five isolates of *E. graminis*, including three collections of *P. ampla* and one each of *P. canbyi* and *P. juncifolia*, a matter of considerable importance in the Pacific

Northwest, where these species of bluegrass are a valuable component of the native forage and powdery mildew is a destructive disease. One collection of *P. pratensis* showed resistance of varying degrees to all the cultures.

Discussing the possibilities of improvement in *P. pratensis*, the writer points out that the high incidence of apomictic reproduction in the species has discouraged hybridization, instead of which individual plant selection methods have been largely utilized. However, successful hybrids between *P. arachnifera* and *P. pratensis* have been reported (*Yearb. U.S. Dep. Agric., 1937*. pp. 1032–1102. 1938) as comparing favourably, especially in dry years, with outstanding selections of the latter species. One accession of *P. arachnifera* has shown resistance to powdery mildew and other diseases, and it seems that further hybridization between this species and *P. pratensis* offers interesting possibilities, especially as a proportion of the hybrids are fertile and would therefore be amenable to plant-breeding methods inapplicable to apomictic strains.

Noble (M[ary]) & Gray (E[lizabeth] G.). **Blind seed disease of Ryegrass.** - *Scot. J. Agric.*, xxv, 2, pp. 94–97, 1945.

Perennial ryegrass [*Lolium perenne*] is of great importance in Scotland and elsewhere in Great Britain as one of the principal grasses for sowing down to hay or pasture. To encourage seed production, a price control Order was introduced in 1942 to assure growers a reasonably remunerative return based on the purity of their material, and in this connexion an account is given of the life-history of the agent of blind seed (*Phialea temulenta*) [*R.A.M.*, xxi, p. 455; xxiv, p. 157], a virulent contaminant (also of Italian ryegrass [*L. multiflorum*]) which it is essential to eliminate from nuclear seed stocks intended for multiplication. Control measures directed towards this end are summarized.

Thirumalachar (M. J.). **Two new records of Sphacelia from Mysore.**—*Nature, Lond.*, clv, 3935, pp. 395–396, 2 figs., 1945.

Collections of ergot on wild grasses made by the author in Mysore have included the sphacelial and sclerotial stages on *Brachiaria distachya* and the former, associated with abortive or immature sclerotia, on *Amphilophis pertusa*. Heavy *Cerebella* infestation was uniformly present [cf. *R.A.M.*, xxi, p. 526] and, in fact, revealed the occurrence of *Sphacelia* among a group of healthy plants. Individual flowers in the spikelets of *B. distachya* are attacked. Shortly after infection a drop of sugary secretion may be observed, at first translucent, subsequently hardening into a whitish crust with which saprophytic yeast cells are intermingled. Numerous oblong-ovate, slightly arcuate spores of the *Sphacelia*, 12·6 to 19 by 3·8 to 6·3 μ, tapering towards the apices, become embedded in the nectar. Subglobose to spherical sclerotia are formed only in the rare absence of *Cerebella*, so that the identity of the species of *Claviceps* concerned remains for the present obscure.

On *A. pertusa* also the *Sphacelia* is confined to individual florets, and here again sclerotial formation is impeded by *Cerebella*. Hyaline, triangular conidia, 8·8 to 11·4 by 6·3 to 7·7 μ, with somewhat rounded ends, are borne in profusion on a felt of conidiophores arising from the surface of the ovary. The shape of these spores being at variance with the *Sphacelia* of the *Claviceps* species recorded on other members of the Gramineae and Cyperaceae, the name of *S. amphilophidis* is tentatively assigned to the fungus, a full description and diagnosis of which is being published elsewhere.

Brichet (J.). **Le 'crown gall' ou 'broussin infectieux' tend a s'étendre dangereusement dans les vergers.** [Crown gall or infectious excrescence is tending to spread dangerously in the orchards.]—*Fruits & Primeurs*, xiv, 149, pp. 133–134, 2 figs., 1944.

A brief, popular account is given of the symptoms and control of crown gall

(*Bacterium tumefaciens*) of fruit trees [*R.A.M.*, xxii, pp. 31, 258; xxiii, p. 379]. In Algeria, young apricot, almond, plum, and peach trees are increasingly affected, and the author has also observed the disease on 4- or 5-year-old pears and pomegranates.

Lewis (F. H.). **Effect of spray injury on pre-harvest drop of McIntosh Apples.** – *Phytopathology*, xxxiv, 12, pp. 1015–1019, 1944.

In an experiment conducted in Wayne County, New York, in 1942, under uniform cultural conditions, the extent of perceptible foliar injury and pre-harvest drop of McIntosh apples varied significantly with the spray treatment. Co-variance analysis revealed a highly significant correlation between spray damage and pre-harvest drop, both being heavier on trees treated with lime-sulphur, lead arsenate, and lime in the cover sprays, than on those to which flotation sulphur was applied instead of lime-sulphur, while the other ingredients remained the same. On 30th September, the percentage of dropped fruits out of a total of 1,844 per tree in the block treated with the lime-sulphur formula was 47·18 compared with 24·24 for the trees sprayed with the flotation sulphur (1,759 fruits per tree), the corresponding percentages of picked fruits and crates of 1·2 bush. being 47·35 and 6·3 and 70·95 and 9·3, respectively.

Hildebrand (E. M.). **Myrobalan mottle and asteroid spot.** – *Phytopathology*, xxxv, 1, pp. 47–50, 2 figs., 1945.

During the last five years, two abnormalities, 'mottle' and 'asteroid' spot, have been observed in myrobalan plum (*Prunus cerasifera*) seedlings of Californian origin used as rootstocks for plum propagation in nurseries in New York State. 'Mottled' leaves are small, irregular, with undulating surfaces, and bearing dark green areas visible by reflected light. The condition is prevalent in nursery plantings but affects only a small proportion of the seedlings, usually not exceeding 5 per cent.; it is seed-borne, perpetuated by buds, and presumably of genetic origin.

'Asteroid' or 'chlorotic' spot is characterized by the development on the foliage, at any time during the growing period, of variable numbers of persistent, star-shaped, chlorotic spots, about 2 mm. in diameter, which cause distortion of the parts involved. The stem lesions are generally oval and occasionally become necrotic. All the rootstock collections so far assembled have contained a varying incidence of 'asteroid' spot – up to 90 per cent. in the 22 procured in 1942. In several tests the percentages of buds surviving and growing the following season were considerably lower than in normal seedlings, sometimes less than half. The stem growth from Italian buds inserted into diseased rootstocks was often stunted and developed typical 'asteroid' symptoms. These have been practically eliminated by raising plants from seed in the greenhouse, but the possibility of masking by high temperatures is not hereby excluded: symptomless seedlings grown in this way sometimes contracted 'asteroid' spot on transference to the field. For the present the etiology of this disorder remains obscure.

Hildebrand (E. M.). **The Cherry virus complex in New York.** – Abs. in *Phytopathology*, xxxiv, 12, p. 1003, 1944.

In addition to the components of the New York cherry virus complex already described [*R.A.M.*, xxiii, p. 492], four more have been differentiated on sour cherry, namely, yellows (*Chlorogenus cerasae*), ring spot (*Annulus cerasae*), green-ring yellows, and rosette, and two on sweet cherry, tatter-leaf and mottle. The seed-transmissible crinkle on sour cherry is apparently of genetic origin. The several viruses are easily communicated by grafting from diseased to healthy material, on which distinctive symptoms are produced. On Montmorency the incubation periods of ring spot and rosette are short (about a fortnight) and those of yellows

and green-ring yellows long (a year or so), while on Black Tartarian tatter-leaf develops rapidly and mottle slowly. On peach, ring spot induces temporary necrosis and yellows causes either rosette and stunting, mosaic, or no symptoms.

Hildebrand (E. M.). **Can the adverse effects of virus diseases be corrected by extra fertilization and pruning the Montmorency Cherry?**—*Plant Dis. Reptr*, xxviii, 35, pp. 1057–1060, 1944. [Mimeographed.]

From 1938 to 1941, inclusive, a detailed study was made of a degeneration condition present in a Montmorency cherry orchard, and previously attributed to winter injury, but later shown by successful graft transmissions to be of a virus nature.

Four virus diseases were found to be present, viz., yellows, ring spot, green-ring yellows, and rosette [see preceding abstract]. Green-ring yellows and rosette affected only eight and two trees, respectively, out of 940; in 1941, the trees showing definite symptoms of yellows virus numbered 524, or 56 per cent. of the orchard, with an additional 265, or 28 per cent., showing early stages of infection. The confusing element in the cherry-virus complex is the ring-spot necrosis which, after the initial shock, leaves the trees almost without external symptoms, except for a mild ring spot on the unfolding leaves in spring and a reduced vitality commonly called winter injury, which is characterized by a stubby terminal growth. The only accurate way to appraise ring spot is to index young healthy trees. This was done on about a quarter of the orchard, with 38 per cent. positive results. Over 60 per cent. of the trees positive for ring spot were also affected by yellows.

Extra fertilization and drastic pruning were of no lasting benefit against these virus troubles, which were the real source of the so-called winter injury.

Milbrath (J. A.) & Zeller (S. M.). **Latent viruses in stone fruits.**—*Science*, N.S., ci, 2614, pp. 114–115, 1945.

The Kwanzan and Shirofugen varieties of *Prunus serrulata* are proving to be much more reliable indicators than peach of the presence of latent infection by the cherry virus complex [see preceding abstracts] in Oregon, developing severe reactions to the introduction of diseased sweet or sour cherry buds. For instance, Kwanzan budded in August with viruliferous sweet cherry buds produces small, curled leaves with split necrotic veins, which form tight rosettes with scarcely any stem elongation. Small nursery trees may die or put out new growth only below the point of bud insertion. The sweet cherry bud, however, often grows normally and may be the only living branch on the trunk. The response of Shirofugen is quite different, the area round the inserted bud becoming necrotic and embedding the scion and budding rubber in a mass of black gum by the autumn. By the following spring the stem is completely girdled for 5 to 6 in., but the foliage and new growth develop normally. With the expansion of the first leaves to full size, however, entire spurs of foliage near the canker suddenly turn brown and shrivel with the leaves still attached, and as the weather becomes warmer and drier, the whole branch beyond the point of bud insertion rapidly dies. At the same time, many branches crack at the greatly constricted site of bud insertion, whence the necrosis spreads slowly down and out into the laterals, causing symptoms similar to the foregoing. Comparable reactions occur when Shirofugen is budded after the onset of growth in the spring.

Nearly all the buds from Bing, Lambert, Royal Ann, Black Republican, Black Tartarian, and Montmorency cherry also evoked positive reactions on the two *P. serrulata* varieties under observation, preliminary tests with which gave negative results for the presence of virus on Elberta peach and Mahaleb [cherry] seedling. By means of more extensive trials (already in progress with the two last-named

species) it is hoped to locate one virus-free tree of each of the standard commercial varieties to serve as a foundation for future nursery stock.

Kunkel (L. O.). **Transmission of virus from X-diseased Peach trees to herbaceous plants.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

With the aid of dodder (*Cuscuta campestris*) [cf. *R.A.M.*, xxiii, p. 247], a virus was transmitted from X-diseased peach trees to carrot, parsley, periwinkle [*Vinca* sp.], and tomato, and also from infected to healthy plants of each of these species, but attempts to convey it from peach or the herbaceous plants to peach gave negative results. Since the virus was transmitted from X-diseased trees in four orchards but could not be obtained from trees of healthy appearance in the same locations, it is presumed to be the X-disease virus. Tomatoes reacted to invasion by wilting and death; carrots and parsley by chlorosis of young and reddening and yellowing of old leaves; and periwinkle by yellowing of the foliage at all stages and marked floral stunting. Except for tomato, all the plants inoculated with the virus assumed an erect growth habit and gave rise to an abnormal number of secondary shoots.

Daniels (L. B.). **The Peach mosaic disease.**—*Science*, N.S., ci, 2613, pp. 87–88, 1945.

Proof has been obtained in controlled greenhouse and field trials at the Colorado Agricultural Experiment Station and in the Western Slope region of the State that the peach mosaic virus is transmissible by *Myzus persicae* [*R.A.M.*, xxii, p. 382]. Both viviparous apterous and alate forms of the aphid were used after feeding for varying periods on diseased flowers and foliage. For the transference of the insects, infected material was suspended in the top of the test seedling to which they migrated. Eighteen out of 25 trees exposed to this mode of infestation developed mosaic symptoms, while controls of the same age grown under comparable conditions remained healthy. In the greenhouse the symptoms tended to be mild, and each test was therefore followed through at least one period of dormancy and further verified by bark-grafting into uninfected seedlings and June-budded Elberta trees. In one instance, typical mosaic symptoms appeared within 20 days in five bark-grafted trees.

Nattrass (R. M.). **The transmission of the virus of the 'woodiness' disease of Passion Fruit (Passiflora edulis) by single leaf grafts.** *Ann. appl. Biol.*, xxxi, 4, pp. 310–311, 1 pl., 1944 [1945].

In tests of the transmission of the virus causing woodiness disease of passion fruit [*R.A.M.*, xix, p. 664] a single leaf-grafting method was devised, in which a medium-sized leaf was removed with at least 1 in. of petiole. The latter was cut or scraped to an elongated wedge. A downward cut was made on the stock, almost parallel to the stem, which opened up a thin strip of cortex. The petiole was then inserted as far as possible, and the whole bound up with a strip of rubber tape, to make an airtight cover. With large leaves it was found advisable to cut down the area of leaf surface in order to reduce any tendency to wilt, unless the plants were to be kept in conditions of high humidity. It made no difference whether the dorsal or ventral surface was uppermost.

The advantages of the method are that one infected vine will supply material for a number of grafts over a long period, the graft can be made at any point on the stem of the stock, no supports are required, and no special precautions are necessary to keep the graft moist. Over 200 of these grafts were made in an ordinary greenhouse, and leaves grafted on to mature vines in the open during the rainy season. As a rule it is possible to tell after 24 hours whether a graft has taken, the leaf wilting when failure occurs. All types of the virus so far found have been transmitted

in this way. No difficulty was experienced in making interspecific grafts in the genera *Passiflora* and *Tacsonia*, in grafting leaves of *Passiflora* spp. on to indigenous species of *Adenia*, or in passing the virus from *Passiflora* to *Adenia*.

Herrick (J. A.) & Kempf (J. E.). **A study of the fungistatic and fungicidal properties and of the toxicity for mice of sodium azide.**—*J. Bact.*, xlviii, 3, pp. 331–336, 1944.

The growth of nine species of fungi of widely divergent taxonomy and habitat, namely *Aspergillus niger*, *Penicillium notatum*, *Mucor rhizopodiformis*, *Trichophyton mentagrophytes*, *Alternaria solani*, *Stereum gausapatum*, *Blastomyces dermatitidis*, *Histoplasma capsulatum*, and *Monilia* [*Candida*] *albicans*, was completely inhibited by exposure to 0·01 per cent. sodium azide in a liquid medium, and largely suppressed by a concentration of 0·001 per cent., but *H. capsulatum* was the only one to be killed in 24 hours by a 5 per cent. solution of the chemical. Sodium azide proved to be highly toxic to mice, and its fungistatic action was reduced tenfold by the presence of blood. It is therefore of no prospective value as a chemotherapeutic agent in fungal infections.

Groves (A. B.). **Sulphur sprays.**—*Bull. Va agric. Exp. Sta.* 359, 22 pp., 3 figs., 1944.

Lime-sulphur remains the most economical and effective fungicide for the control of the apple diseases in Virginia, but from the standpoint of safety it is excelled by the elemental sulphurs, of which flotation sulphur is the most efficient, followed by the Grinrod, micronized, and roller-mill ground products. Only under very hot, dry conditions is injury likely to be caused by these brands of sulphur in the first two or three cover sprays, for which they may conveniently replace Bordeaux mixture. They give moderately good control of scab [*Venturia inaequalis*], but are ineffectual against bitter rot [*Glomerella cingulata*] or blotch [*Phyllosticta solitaria*]. Elemental sulphur is extensively used against peach brown rot [*Sclerotinia fructicola* and *S. laxa*] and scab [*Fusicladium carpophilum*], proprietary brands including Chipman '95', Crown, Sulfix, Dritomic, Hytox, Virginia Top, and Wet Spray.

Marsh (P. B.). **Salts as antidotes to copper in its toxicity to the spores of Sclerotinia fructicola.**—*Phytopathology*, xxxv, 1, pp. 54–61, 3 graphs, 1945.

Experiments are described, and the resultant data tabulated, showing that calcium chloride, magnesium chloride, and potassium chloride salts may counteract or antidote the inhibitory effect of copper sulphate on the germination of the conidia of *Sclerotinia fructicola*, thereby confirming the observations of Lin [*R.A.M.*, xx, p. 414]. For instance, the germination percentage in 4×10^{-7} M copper sulphate plus 0·01 per cent. glucose in the presence of 10^{-5} magnesium sulphate was 54, the corresponding figures for the 10^{-4} and 10^{-3} concentrations being 67 and 78 compared with 1·2 for the controls without added salts. The addition of calcium chloride at 10^{-5}, 10^{-4}, and 10^{-3} M to the copper sulphate permitted the germination of 31, 62, and 83 per cent., respectively, of the conidia, as against 0·8 in the controls. In the case of potassium chloride only the maximum dosage of 10^{-2} M acted in a comparable manner, allowing 59 compared with 2·9 per cent. germination.

The inimical effects of the salts on the copper compound were similarly reflected in the respiratory rates of the conidia. Thus, the consumption of oxygen in c.mm. per million spores during the seventh hour in the control series of cultures, in those containing 2×10^{-4} M copper sulphate, and the same plus 2×10^{-2} magnesium sulphate was 9·11, 0·93, and 5·00, respectively, the corresponding germination percentages after eight hours being 95, 0, and 40, respectively. When calcium chloride was added at the same concentration to the copper sulphate the oxygen consumption in c.mm. per million conidia (sixth hour) was 7·31 compared with

9·39 in the controls and 1·03 in the presence of copper sulphate alone, the corresponding germination percentages being 87, 93, and 0·02, respectively.

The high incidence of spore germination induced by the protective action of the salts was also found to be associated with decreased copper absorption. For example, the amounts of copper absorbed per million conidia in two ten-minute experiments in a mixture of 10^{-2} M calcium chloride and 10^{-4} M copper sulphate were 0·36 and 0·45 γ compared with 2·50 and 2·30 γ in the presence of the latter compound alone. Comparable results were secured with magnesium sulphate. In ten tests with copper sulphate plus calcium chloride the germination percentages ranged from 64 to 95 per cent. as against 0 to 2 per cent. in the 'minus salt' plates, the corresponding figures for magnesium sulphate being 84 to 96 and 0 to 2 per cent., respectively. The effect of potassium chloride was again weaker than that of the other two salts.

Watson (R. D.) & Nikitin (A. A.). **A new dust with adherence.**—Abs. in *Phytopathology*, xxxiv, 12, pp. 1013–1014, 1944.

One of the main limitations of fungicidal dusts in general is their poor adhesiveness but this difficulty was overcome in recent tests by the addition to the standard copper-sulphur (10 : 90) dust of 20 per cent. clay and 2 per cent. highly sulphonated oil, the former ingredient being designed to assist the dispersion and absorption of the latter. The distribution of the material in this form is more uniform, and better coverage of the leaves is effected with less dust than in the case of the standard formula. Following over 3 in. rain the improved compound left an evident residue on the foliage.

American type culture collection. 4 pp., Georgetown University School of Medicine, Washington 7, D.C., 1944.

Pending the publication of a new catalogue, this leaflet lists over 200 genera represented in the American type culture collection of the Georgetown University School of Medicine, Washington, D.C. [*R.A.M.*, xviii, p. 195], and shows the total number of species and strains within each genus. The price of each culture is $2, and an additional charge of 35c. for one culture, and of 50c. for from two to seven cultures is made to cover the cost of packing and domestic postage.

Dillon Weston (W. A. R.) & Smith (K. M.). **Crop diseases and their control.**—*J. R. agric. Soc.*, cv, pp. 125–132, 8 figs., 1944.

The writers describe in popular terms some well-known seed-, soil-, and air-borne diseases of cereals and the viruses affecting potatoes, sugar beet, and crucifers, and suggest appropriate measures for their control.

Blunck (H.). **Winterschäden 1941/42 in Rheinland.** [Winter injury in 1941–2 in the Rhine Province.]—*Z. PflKrankh.*, liv, 1–2, pp. 18–36, 5 figs., 1944.

Details are given of the damage suffered by various kinds of cultivated plants in the Rhine Province during the abnormally severe winter of 1941–2. Among park and forest trees, conifers sustained relatively the heaviest losses, while evergreen ornamentals were the most susceptible of the hardwoods. At least a third of the peach stand in the vicinity of Bonn was destroyed, while sweet, sour, and ornamental cherries displayed malformations of different kinds, including an elongation of the normally inconspicuous scaly leaves into foliage leaves, a flagelliform extension of the terminal bud following the freezing of most of the short shoots with floral rudiments, and slitting of the foliage. Physiological factors are believed to be at least equally implicated with fungal infections in the calamitous dying-off of sweet cherries in the Boppard district which is increasing year by year

and constitutes a serious economic problem deserving of investigation by modern methods. The rigorous conditions also caused substantial injury in the vineyards.

Infection by *Fusarium* [*Calonectria graminicola*] was no doubt a contributory cause of the reduction in the rye crop. Particulars of seed treatment are not available, but presumably shortage of man-power and pressure of other work interfered with the normal procedure in the Rhine Province as elsewhere.

Colza plants in waterlogged soil developed a destructive root rot as a sequel to oxygen deficiency and heart necrosis under the influence of desiccating east winds in March, the latter condition also affecting cabbage.

Addy (C. E.) & Aylward (D. A.). **Status of Eelgrass in Massachusetts.**—*J. Wildlife Mgmt*, viii, 4, pp. 269–275, 1 fig., 1944. [Abs. in *Exp. Sta. Rec.*, xcii, 3, p. 387, 1945.]

A survey conducted in 1943 revealed an extensive renewal of *Zostera marina* at many points along the Massachusetts coast, following a steady increase during the preceding four years, though it was nowhere as prolific as before 1930. The agent of the eelgrass disease (*Labyrinthula*) [*macrocystis*: *R.A.M.*, xxiii, p. 141] was still in evidence, but birds of various kinds were observed on the beds, which apparently provided adequate quantities of winter food. In a footnote mention is made of the occurrence, subsequent to the submission of this paper for publication, of widespread blackening and degeneration characteristic of the disease, the effects of which on the health and survival of existing beds are under investigation.

Hetherington (D. C.). **Mold preventive for book bindings.**—*Science*, N.S., ci, 2618, p. 223, 1945.

A solution consisting of 10 gm. thymol crystals, 4 gm. mercuric chloride, 200 c.c. ether, and 400 c.c. benzene was effective in preventing an outbreak of mould on the bindings of books [cf. *R.A.M.*, xix, p. 635] stored in a current of damp air.

Brien (R. M.) & Denne (R. W.). **Investigations into causes and control of moulds in State houses.**—*N.Z. J. Sci. Tech.*, B, xxvi, 4, pp. 174–181, 8 figs., 1945.

State houses in New Zealand within two years of completion have shown a black discoloration on plaster-board ceilings, associated with the presence of *Cladosporium herbarum*, while blue-green or yellowish moulds (*Penicillium commune*, *P. chrysogenum*, and *Aspergillus versicolor*) have been found on wall-papered surfaces. A survey by the State Advances Corporation revealed the condition in 52·7 per cent. of the houses inspected, irrespective of locality, aspect, site, or type of structure. The moulds were experimentally shown to grow only on plaster-board coated with glue size, distemper, or flour paste, and to be controllable by the addition to these materials of 2 per cent. santobrite (sodium pentachlorphenate) at the rate of 3¼ oz. per gal.

Bindal (A. N.) & Sreenivasaya (M.). **Studies in industrial enzymes. Part II. Malt residues as raw material for the production of fungus diastase and its application to the saccharification of cereals**—*J. sci. industr. Res., India*, iii, 7, pp. 287–289, 1945.

After pointing out that the residue obtained from barley or any other cereal during brewing and the processing of malt extract constitutes a rich substratum for the growth of *Aspergillus oryzae* and other diastase-producing micro-organisms, the authors state that the resulting mouldy residue or the extract from it can be used for the direct saccharification of cereals without subjecting them to malting [*R.A.M.*, xxiv, p. 67].

Barley, ragi [*Eleusine coracana*], jowar [sorghum], maize, bajra [*Pennisetum typhoides*], and wheat, purchased in the local bazaar, were separately steeped in

running water for 48 hours, when they began to sprout. The grains were allowed to germinate in trays until the roots were about $\frac{1}{4}$ or $\frac{3}{8}$ in. long. The grains were then sun-dried and subsequently kilned at 90° to 100° [C.] for one hour. The rootlets were removed and the malt powdered. The extract was prepared by digesting 100 gm. of the malted powder with 600 c.c. water for five to six hours at 50°. The extract was then filtered on a Buchner funnel, and the residue pressed, dried, powdered, and used as a substrate for growing *A. oryzae*.

A weighed amount (10 gm.) of each residue was moistened with 15 c.c. water in a 250 c.c. conical flask, autoclaved at 20 lb. for 30 minutes, and the residue inoculated with spores of the fungus. The flasks were then incubated at 30° for four days, being shaken at intervals. The mouldy mass was extracted, and the diastatic activity of the extract determined. The results [which are tabulated] definitely establish the eminent suitability of these residues as raw materials of much economic value in the production of industrial and pharmaceutical diastases.

The diastase-producing capacity of these residues was appreciably increased by the addition of 10 per cent. of groundnut cake.

A comprehensive study of the extent of solubilization of various cereals by treating them with a given mouldy bran (prepared by growing *A. oryzae* on wheat bran) demonstrated that in the case of barley, the process of direct enzymatic digestion yields an extract of higher specific gravity than that possessed by the extract obtained from the malted barley under similar conditions.

Fawns (H. T.). **Food production by micro-organisms. Part III. Vitamins.**—*Food Manuf.*, xix, 11, pp. 395–400, 1944.

This is the final instalment of the author's series of articles [cf. *R.A.M.*, xxii, p. 491] indicating some of the main conclusions concerning the synthesis of food substances by micro-organisms and supplying bibliographical references to papers dealing with the subject in greater detail. The use of micro-organisms as vitamin sources is discussed.

Gershenfeld (L.) & Ruthenberg (W. W. W.). **Molds and yeasts in dairy products.**—*Amer. J. Pharm.*, cxvi, 7, pp. 256–267, 1944.

Potato dextrose agar was found to be the most suitable of the various standard media tested at the Philadelphia College of Pharmacy and Science for the estimation of moulds, notably *Oospora lactis*, and yeasts in dairy products, viz., buttermilk, cream cottage cheese, butter, and sour cream [*R.A.M.*, xxiv, p. 26] of which the last-named was subjected to intensive studies to determine the causes of contamination. In addition to plate counts, smears were made from the sour cream as received and after 24 hours' incubation at 70° F. The data secured by the two methods were substantially in agreement, the microscopic examination being particularly valuable in the case of heavy contamination. The impurities were attributed in the main to defective sterilization of equipment, exposure of the cream to air, contaminated cultures, and an excess of moulds and yeasts in the processing plants. The trouble was effectively combated by the application of a chlorine rinse (100 p.p.m.) or spray (200 p.p.m.) to the machinery, culture rooms, incubating tanks, coolers, pasteurizers, bottles, &c., and other precautions to ensure sterility.

Lindegren (C. C.). **Heterocaryosis and heterosis in the fungi; their biological and industrial significance.** –Abs. in *Genetics*, xxx, 1, p. 13, 1945.

Heterocaryosis is stated to be the natural condition of the filamentous Ascomycetes. In *Neurospora crassa*, for instance, the natural heterocaryon generally contains both plus and minus nuclei, but these are ordinarily incompatible when originating in the same locality, and intra-strain sterility limits hybridization to

matings between cultures from different sources. The genetical obstacle to fertility can be removed either by anastomoses with another strain or by the diffusion of hormones or vitamins into the substratum. A homocaryon obtained from a freshly isolated mononucleate cell soon becomes heterocaryotic by mutation, and most old cultures can be shown to comprise a variety of genotypes. This phenomenon tends to reduce the potency of penicillin-producing cultures of *Penicillium notatum* [*R.A.M.*, xxiv, p. 27]. One artificially developed heterocaryon of the mould was found to have a much lower capacity for penicillin production than that of either original culture. Another heterocaryon between an average and a high producer possessed the same potency as the latter, thus showing that the low producer was deficient in some substance essential for penicillin production which was supplied in excess to the combination by the higher producer.

Lee (S. W.), Foley (E. J.), & Epstein (Jeanne). **Plant growth substances and Penicillium notatum.**—*Nature, Lond.*, clv, 3933, pp. 333–334, 1945.

In experiments at the Wallace Laboratories, Inc., New Brunswick, New Jersey, to determine the effect of the hormones indole-3-acetic acid and α-naphthalene acetic acid on penicillin production by *Penicillium notatum*, the former, at 1 in 10,000, gave the most rapid high titre of the antibiotic (50 Florey units per ml. six days after inoculation of the Czapek-Dox brown sugar medium), while the latter was more active at 1 in 100,000 (50 units in seven days).

Wiedling (S.). **The production of antibiotics by Penicillium species.**—*Bot. Notiser, 1944*, pp. 433–443, 2 graphs, 1944.

Using an adaptation of the cylinder-plate method of Abraham *et al.* [*R.A.M.*, xx, p. 484] and modifications of the Czapek-Dox [loc. cit.] and Raulin-Thom media (*Lancet*, ccxlv, p. 625, 1943), the author tested the antibiotic action on *Staphylococcus aureus* of a number of *Penicillium* species, only five of which, namely, *P. brunneo-violaceum*, *P. chloroleucon*, *P. chrysogenum*, *P. citrinum*, and *P. griseo-roseum*, showed any remarkable inhibitory properties. Of these, *P. brunneo-violaceum*, *P. chloroleucon*, and *P. griso-roseum* are here recorded for the first time as sources of an antibiotic substance. The activity of *P. chrysogenum* and *P. griseo-roseum* was of the same order of magnitude as Fleming's strain of *P. notatum*, while that of the other three species was slighter.

Weimer (J. L.). **Macrophomina root and stem rot and anthracnose of Chamaecrista.**—*Phytopathology*, xxxiv, 12, pp. 1077–1085, 3 figs., 1944.

Chamaecrista procumbens and *C. fasciculata*, commonly known as partridge or sensitive pea, are low, woody annuals growing wild along highways and on waste ground in the south-eastern United States, where their ability to survive such adverse conditions suggested the possibility of utilization in the prevention of soil erosion. For this purpose the plants are under investigation in Soil Conservation Nurseries. The present studies were conducted in Alabama and Georgia.

Both species are liable to virulent infection by *Glomerella cingulata*, the agent of anthracnose, while *C. procumbens* is also susceptible to root and stem rot (*Macrophomina phaseoli*). *G. cingulata* can destroy seedlings in a few days, but in the case of older plants only the actively growing ends of the branches are subject to attack.

Magrou (J.), Bouget (J.), & Bouget (C.). **Sur un pied de Pomme de terre dépourvu de tubercules.** [On a Potato stool deprived of tubers.]—*Ann. Inst. Pasteur*, lxxi, 1–2, pp. 42–43, 1945.

In the course of experiments involving the sowing of potato seed at Bagnères-de-Bigorre (Pyrenees) in mycorrhizal soils [*R.A.M.*, xxiii, p. 452], a seed fell on the soil of a disused greenhouse bench exposed to frost and desiccation. Notwithstanding

these adverse conditions, the seed thus accidentally sown germinated and produced a very vigorous plant, which was, however, destitute of tubers in contrast to the plants arising from seed in the mountain soils. A comparative examination of the root systems revealed a profusion of actively growing mycorrhizal endophytes in the latter which were completely absent from the former. This unplanned test lends further weight to the hypothesis, based on repeated observations, of a correlation between adjustment to mycorrhizal symbiosis and tuberization.

McKay (R.) & Clinch (Phyllis E. M.). **Leaf roll infection in the Potato varieties Skerry Champion, Shamrock, and Matador.**—*J. Dep. Agric. Éire*, xli, 2, pp. 200–208, 5 figs., 1944.

After pointing out that potato inspectors in Éire have consistently maintained that leaf roll is scarcely ever seen on the Shamrock and Skerry Champion varieties, the authors describe an experiment in which six plants of Skerry Champion and six of Shamrock were grown in pots in the greenhouse and top-grafted with infected scions. Most of the grafted plants later showed primary leaf roll in the axillary shoots, and a year later the tubers of all units gave plants with secondary leaf roll. No difficulty was experienced in detecting the presence of the disease in Skerry Champion, the symptoms being of the ordinary medium type. On the other hand, the diagnosis of leaf roll in Shamrock in the field was by no means easy, affected plants were small and slightly chlorotic, particularly at the tops, while there was a reduction in yield of about 50 per cent. Further experiments clearly demonstrated that both Skerry Champion and Shamrock were susceptible to sprout infection with leaf roll by means of aphids. To test susceptibility to natural infection in the field, six plants each of Skerry Champion, Shamrock, Arran Cairn, Golden Wonder, President, and Champion were grown in short drills alternating with drills of infected British Queen. During the season, none of the Skerry Champion or Shamrock plants showed primary leaf roll, though one Skerry Champion tuber failed to grow. The tubers of all the plants were grown the following year, when the number of infected units was Skerry Champion 0, Shamrock 1, Arran Cairn 5, Golden Wonder 5, President 5, and Champion 4, in each case out of 6. Similar experiments were made in 1940, 1941, and 1942. In this study, Skerry Champion gave 100, 78, and 2 per cent. infection by stem grafting, sprout infection by aphids, and natural infection in the field (6, 87, and 46 plants tested), respectively, Shamrock 100, 51, and 8 per cent. (6, 41, and 95 plants tested), respectively, and President 92 and 89 per cent. for sprout infection by aphids and natural infection, out of 26 and 18 plants tested, respectively.

When Matador plants were grown out-of-doors, the disease showed up plainly in the lower leaves when they were about seven weeks old. The affected units were somewhat stunted, and the margins of the lower leaflets were rolled slightly upwards. The terminal leaflet of the lower leaves showed a pale, yellowish-green colour, which contrasted with the normal green of the rest of the foliage. When the plants were in full flower the rolled leaflets opened, and only the margins presented a slight upward curvature. The pallid appearance of the terminals of the basal leaves persisted, remaining the most prominent indication of the presence of the disease. When scions from these plants were grafted on to President, typical leaf roll developed in the stocks. Over a period of three years, the disease caused a reduction in yield of about 58 per cent.

The data obtained confirm the view that Shamrock is able to withstand intensive infection in the field, and demonstrate that Skerry Champion is resistant almost to the point of immunity under field conditions. The symptoms on Skerry Champion are such that they are not likely to be overlooked; in Shamrock, on the other hand, the disease may be more prevalent than has been realized.

Clinch (Phyllis E. M.), Loughnane (J. B.), & McKay (R.). **Notes on the leaf roll and mosaic diseases of Potatoes in relation to seed Potato production.**—*J. Dep. Agric. Éire*, xlv, 2, pp. 263–276, 11 figs., 1944.

These notes are a slightly amended form of those prepared by the authors in 1940 and issued by the Department of Agriculture, Dublin, for the use of their Potato Inspectors. The diseases dealt with are leaf roll, which is stated to be comprehensively dealt with in Leaflet 29 of the Department of Agriculture, Dublin, and mosaic. Brief notes are given on the symptoms and insect transmission of the former, and the susceptibility of different varieties is indicated. The mosaic diseases dealt with are those caused by potato viruses X (simple mosaic virus), B (Up-to-Date streak virus) [a strain of X: *R.A.M.*, xxiii, p. 403], A, Y (leaf-drop streak virus or veinbanding virus), F (tuber blotch or pseudo-net necrosis virus), and G (aucuba mosaic virus). The paper concludes with brief notes on the following diseases due to combinations of viruses: crinkle (X+A), rugose mosaic (X—Y), and interveinal mosaic (X+F).

Bekius (J.). **Bladrolziekte en potergroote bij Aardappel.** [Leaf roll disease and seed size in Potatoes.]—*Tijdschr. PlZiekt.*, xlviii, pp. 69–71, 1942. [Abs. in *Z. PflKrankh.*, liv, 1–2, pp. 44–45, 1945.]

Field experiments carried out in 1940 to verify the opinion, now widely held in the Netherlands, that small, early-harvested seed potatoes produce healthier plants, especially in respect of leaf roll, than large ones lifted later, gave partially confirmatory results. The tubers of early-harvested plants produced stands with less leaf roll and mosaic than those lifted at maturity, but as regards the latter, the progeny of small tubers was little or no healthier than that of large ones. Much weightier are the objections to the use of small seed, such as slow growth, late ripening, and low fertility. A second trial in 1941 with the Roode Star variety afforded proof of the well-known fact that the tubers of leaf-roll plants give a much lower yield (50 per cent. in this instance) than those of healthy stands.

Silberschmidt (K.). **O valor diagnóstico de alterações das qualidades fisiológicas dos tubérculos para o reconhecimento do grau de degenerescência das Batatinhas.** [The diagnostic value of alterations in the physiological qualities of the tubers for the recognition of the degree of Potato degeneration.]—*Ceres, Minas Gerais*, v, 29, pp. 326–351, 1944.

This is a critical survey of the literature on the diagnosis of potato 'degeneration' by means of modifications in the physiological properties of the tubers. Most of the papers cited have been noticed from time to time in this *Review*.

Larson (R. H.). **The identity of the virus causing punctate necrosis and mottle in Potatoes.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

Evidence is forthcoming to identify the virus causing potato punctate necrosis and mottle [in Wisconsin] as an aberrant strain of the potato latent ring spot virus [potato virus X: *R.A.M.*, xxiii, p. 240]. It is readily transmissible by plant extract but not by aphids, remains infective *in vitro* for about a month at 20° to 22° C., tolerates a dilution of 1 to 10,000, and is inactivated by ten minutes' exposure to a temperature of 66° to 67° and by drying. Severe symptoms develop in potatoes kept at 14° to 16° and very mild ones at or above 24°. All the Solanaceae tested were easily infected. *Atropa belladonna* is a symptomless carrier; necrotic lesions are produced on the inoculated leaves of *Amaranthus reflexus* and *Digitalis lanata*, in which the virus is not systemic; and potato seedling 41956 is immune.

Muncie (J. H.), Moore (H. C.), Tyson (J.), & Wheeler (E. J.). **The effect of sulphur and acid fertilizer on incidence of Potato scab.**—*Amer. Potato J.*, xxi, 11, pp. 213–304, 1944.

At the Michigan Agricultural Experiment Station trials have been carried on for several years on the effect of soil acidity on the incidence of potato scab (*Actinomyces scabies*). Untreated tubers of the susceptible Chippewa variety were planted in infested soil and treated with sulphur and with an acid-forming fertilizer composed of ammonium sulphate, acid superphosphate, and potassium sulphate, these two materials being applied together and separately. The soil was considered too acid for optimum growth. Applications of acid alone or in combination with sulphur ploughed-under or disked-in reduced scab infection, though it was still abundant. There was a general increase in yield of clean, saleable tubers. When the acidity was raised in the following years the amount of scab was reduced, but so was the yield of saleable tubers. The maximum benefit was obtained from applications of 1,600 lb. sulphur per acre. When the acidity was low, not only was scab not fully inhibited, but it gradually adapted itself to the condition. When the crop was grown in acid soil and the plot was later treated with lime, scab became more severe, indicating that the disease was only inhibited and not destroyed. After sulphur was added for a second and third year there was a marked decrease in the percentage of clean tubers, although the acidity had shown little increase.

Wheeler (E. J.), Stevenson (F. J.), & Moore (H. C.). **The Menominee Potato; a new variety resistant to common scab and late blight.**—*Amer. Potato J.*, xxi, 11, pp. 305–311, 1944.

In a number of areas in the United States, scab (*Actinomyces scabies*) is becoming such a limiting factor in potato production that the present commercial varieties will have to be abandoned and replaced by resistant sorts. Menominee, though possessing the disadvantage of a late-maturing habit and rough tubers, is being distributed for this purpose: about 2,800 bush. were produced in 1943, most of which was to be grown in 1944 for increase. It is a selection from a cross between the scab-resistant Richter's Jubel and the low-yielding but resistant Seedling 44537. It is highly resistant to scab and moderately so to late blight (*Phytophthora infestans*). Tests show that the yield, whether reckoned as total yield or in U.S. No. 1 potatoes, is much greater than that of either Russet Rural, Chippewa, or Sebago. It has not been much affected by leaf roll or mosaic and possesses other attractive commercial qualities.

Brichet (J.). **Conservation des Pommes de Terre de saison. La 'fusariose' ou 'pourriture sèche'. L'emploi de la réfrigeration.** [Preservation of maincrop Potatoes. 'Fusariosis' or 'dry rot'. The application of refrigeration.]—*Fruits & Primeurs*, xiv, 150, pp. 156–159, 2 figs., 1944.

Dry rot (*Fusarium*) [spp., including *F. coeruleum*] is the most destructive agent of storage rot among maincrop potatoes in Algeria, where the conditions generally obtaining in warehouses and depots, including a constant temperature above 20° C. and a relative humidity exceeding 80 per cent., might be specially selected for the cultivation of the pathogen rather than for the preservation of perishable foodstuffs. Some improvement in the present storage arrangements may be effected by sanitary reforms, but the only radical method of cure lies in the provision of refrigerating installations in which the temperature and atmospheric humidity can be regulated in such a way as to promote the health of the potatoes and suppress the development of the fungi. The results of investigations by F. Weiss and collaborators in Pennsylvania [*R.A.M.*, vii, p. 739] have shown that these objects may be attained by the maintenance of a temperature of 5° to 7° C. and a relative humidity of about 60 per cent. The expense thus incurred would be

amply counterbalanced by the gain of the half of the crop now lost through preventable disease.

Heuberger (J. W.) & Wolfenbarger (D. O.). **Preliminary report on DDT in the Potato fungicide program.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1003, 1944.

DDT (dichloro-diphenyl trichlorethane), $\frac{3}{4}$ in 100, alone or in combination with other fungicides, had no effect on early blight (*Alternaria solani*) on Dakota Red potatoes.

Glick (D. P.), Ark (P. A.), & Racicot (H. N.). **Outline of procedure for the diagnosis of Bacterial ring rot of Potatoes. [Report of the Committee of the Potato Association of America.]**—*Amer. Potato J.*, xxi, 11, pp. 311–314, 1944.

In this report, based on a questionnaire, suggestions are made for the diagnosis of bacterial ring rot (*Bacterium* [*Corynebacterium*] *sepedonicum*). In the field the affected plants may show wilting, rolling of leaves or leaflets, loss of colour, and eventually death, which may not, however, involve all the stems of the plant. If the stem is cut across near the base a creamy exudate may appear. It should be cut across again about $\frac{1}{2}$ in. lower and squeezed slightly. If the tuber is cut across near the stem end a cheesy, cream to light brown rot may exude. This also applies to the examination of stored tubers, in the case of which ultra-violet light may also be used, but must be confirmed by other tests. For definite establishment of the presence of disease as, for example, when recourse to law is contemplated, the exudation must be further tested as follows: (1) Gram-staining of smears from the tuber or better from the lower part of the cut stem afford the most reliable test: the bacteria show as brilliantly stained short rods or elliptical to inequilateral forms, 0·3 to 0·5 by 0·6 to 0·9 μ; (2) the causative organism is isolated and identified; (3) infection is transmitted to a suitable host which itself must answer the tests.

It is pointed out that there will always be a small percentage of cases where positive diagnosis is impossible, and then the next year's crop should be carefully watched.

Simpson (G. W.) & Porter (W. F.). **A roguing service for producers of foundation seed Potatoes.**—*Misc. Publ. Me agric. Exp. Sta.* 584, 21 pp., 1944.

In this publication details are given of the roguing service directed by the Maine Agricultural Experiment Service for the benefit of growers of foundation seed potatoes, and suggestions made for the management of the plots. It was in 1939, in answer to the demand for a good seed, that growers and public agencies in Maine started a foundation seed programme to provide for themselves part of the seed required by growers in the State. The programme has never given more than 25 per cent. of the seed needed, but it has proved helpful in the introduction of some of the newer varieties. The results have fully confirmed the view that seed sources can be maintained by growers within the State.

Among the chief factors in the successful handling of foundation seed plots are (1) a source of seed known to be free from bacterial ring rot [*Corynebacterium sepedonicum*: *R.A.M.*, xxiii, p. 271], (2) early planting by tuber units, (3) isolation, (4) thorough roguing, (5) early harvesting, and (6) storage on the farm where contamination of seed stocks will not occur. If these conditions are observed, growers can be reasonably well assured of securing satisfactory seed.

All fields to be rogued under the supervision of the Experiment Station should be planted by the tuber-unit method. Early planting is essential. The planting of foundation seed plots must be finished before commercial plantings are begun on the same farm. Strong emphasis is laid on the recommendation that early-harvested seed should be sorted for size well ahead of planting and each size planted in a particular area of the plot.

The Experiment Station undertakes to employ roguers and supervise their work. The roguers have to detect and remove diseased units and varietal admixtures. All plants removed for whatever reason are placed in roguing bags and taken to the end of the row. Growers must provide some means for the disposal of diseased tops, The charge for the roguing service is $30 per acre, less any saving in costs.

The bulletin also includes a note by Steinbauer and Steinmetz on the use of chemicals for the elimination of rose, buckthorn [*Rhamnus*], and other aphid hosts.

Paracer (C. S.) & Luthra (J. C.). **Further studies on the stem-rot disease of Rice caused by Sclerotium oryzae Catt. in the Punjab.**—*Indian J. agric. Sci.*, xix, 1, pp. 44–48, 1944.

Rice is one of the staple food grain crops of the Punjab hills, where the crop, which occupies about 1,000,000 acres, is subject to a number of fungal diseases, of which stem rot (*Sclerotium oryzae*) [*Leptosphaeria salvinii*: *R.A.M.*, xx, p. 447] is the most serious and the cause of heavy damage. In some years, this disease destroys half to three-quarters of the crop, while losses of 5 to 15 per cent. are common every year. Infection is most prevalent in the Sheikhupura, Gujranwala, Karnal, and Gurdaspur areas, and is met with to a small extent in the hills.

A study [the results of which are tabulated] of the effect of certain environmental factors upon the disease demonstrated that infection can be reduced by late sowing and late transplanting, but these measures are not recommended. Incidence is increased by keeping water stagnant in the fields throughout the growing period. Nitrogenous manures favour the disease; at Lyallpur Botanical Farm during the years 1935 to 1939, inclusive, for example, the average infection was 27·8 per cent. when sulphate of ammonia was applied at the rate of 1,000 maunds [1 maund = 82·284 lb.] per acre, as against 4·25 per cent. in the untreated control. Of 19 Punjab rice varieties tested, the most resistant were Basmati 370, with 0·1 per cent. average infection for 1935 to 1939, inclusive, at Lyallpur and 1·6 per cent. for 1935 and 1936 at Kala Shah Kaka. Basmati 3, the corresponding infection figures for which were 1·8 and (not tested). Mushkan 7, with 1·1 and 1·1 per cent. infection, Mushkan 41, 1·8 and 3 per cent., and Bara 62, 1·7 and 0·9 per cent.

The control measures recommended include burning diseased rice stubble *in situ*, erecting strong, high 'bunds' round infected fields to check spread by wind and irrigation water, not allowing stagnant water to remain in the fields, and planting resistant varieties.

Cholodny (N. G.). **On volatile organic compounds evolved by living organisms and assimilated by soil microbes.** *C.R. Acad. Sci. U.R.S.S.*, xli, 9, pp. 398–400, 1943.

The results of studies conducted at the University of Kiev in 1939–40 showed that the germinating seeds of various plants release into the surrounding atmosphere volatile organic substances, which in some cases, e.g., peas, appear to contain nitrogen. Using the method already described [*R.A.M.*, xv, p. 527] of incubating soil dust on the surface of clean glass, the author found that the substances in question are intensively assimilated by various micro-organisms, chiefly bacteria and Actinomycetes. Having regard to the immense mass of seeds, tubers, and other plant organs germinating in the soil, and the living roots by which it is penetrated, this source of nutriment may be expected to play an important part in the life of the soil microflora and should be considered in the formation of a general quantitative estimate of the circular exchange of matter in the biosphere. Incidentally, the emanations from ripe apples were observed to exert a powerful stimulus on the growth of Actinomycetes [cf. ibid., xxiii, p. 335].

Weibel (R. O.). **Effect of seed treatment on Castor Beans.**—*J. Amer. Soc. Agron.*, xxxvi, 11, pp. 953–954, 1944.

Castor bean [*Ricinus communis*] seed of the Kentucky 38 variety planted in the greenhouse at the Illinois Agricultural Experiment Station in April, 1944, responded favourably to treatment with arasan and new improved ceresan, which raised the percentage of total emergence from 29·5 to 64·5 and 72·5, respectively. The latter preparation, besides giving a larger increase in the stand, was more effective than the former in preventing post-emergence losses from damping-off. In a field test in May with comparably treated seed, however, the results were less encouraging, the average total emergence (four replications) for the arasan and ceresan plots being only slightly higher than the controls (76·7, 73·5, and 71 per cent., respectively).

Ragl (F. X.). **History of the fight against Peronospora in Germany.**—*Dtsch. Brauindustr.*, lii, p. 161, 1944. [Abs. in *J. Inst. Brew.*, N.S. xlii, 2, pp. 99, 1945.]

Peronospora [*Pseudoperonospora humuli*] was first observed on hops on a large scale in Germany in 1924, when it was named 'brown cone' [*R.A.M.*, iv, p. 635]. In 1926 it was responsible for a reduction in yield in Bavaria to the value of RM. 30,000,000 [ibid., vi, p. 751]. In general, growers were very reluctant to follow the recommendations for spraying with an alkaline copper solution. From 1918 to 1926, the average hop yield was 7·2 zentner [720 kg.] per ha.; in 1926 it fell to 3·2, as a result of which 6,000 spraying equipments were sold and treatment started early in the following May, raising the output for the period 1927 to 1935 to 14·4 zentner per ha.

[An abstract of this paper was published in the Swiss *Rev. Brass.*, *1944*, p. 55, 1944.]

Nelson (R.). **Present status of wilt-resistant hybrid Mints and plans for their further development.**—*Proc. Mich. Muck Fmrs' Ass.*, xxv, pp. 38, 40, 1943. [Abs. in *Plant Breed. Abstr.*, xv, 2, p. 176, 1945.]

Peppermint × spearmint [*Mentha spicata*] hybrids combining satisfactory resistance to wilt (*Verticillium* [*? dahliae*]) with other attractive qualities have been developed at the Michigan State College [*R.A.M.*, xvi, p. 491], where two seedlings in particular promise well as potential substitutes for English peppermint.

Chowdhury (S.). **Diseases of Pan (Piper betle) in Sylhet, Assam. IV. Rhizoctonia root-rot.**—*Proc. Indian Acad. Sci.*, Sect. B, xx, pp. 229–244, 2 graphs, 1944.

The root rot of *Piper betle* caused by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xxiii, p. 457] is responsible for heavy losses wherever the crop is grown in Sylhet, Assam, the percentage of mortality ranging annually from 2 to 47·7 in the different 'borojes' (straw- or grass-sided houses on a bamboo framework). The disease is most prevalent during October and November. Pallor and drooping of the leaves are the first external symptoms of the attack on the root system. The tissues of the girdled areas of the stem at or just below soil-level turn black, and the roots are reddish and disintegrated. The pathogenicity of the fungus was established by inoculation experiments, involving (*a*) infection of the plants by direct contact and (*b*) infestation of the soil with rice straw cultures.

Mycelial growth and sclerotial formation were most profuse on oat, Czapek's, potato dextrose, and *P. betle* extract agars, Brown's synthetic agar being very unsatisfactory as a substratum. Depth of the medium was another important factor in sclerotial development, which was heavier in dishes containing 70 c.c. Czapek's agar than in those with 40 or 20. A normal concentration was the most conducive to the production of sclerotia, which were not formed at all above that point and only in comparatively small numbers below it. The optimum tempera-

ture for this phase in the life-history of the pathogen appears to be between 25° and 30° C., and the most favourable hydrogen-ion concentration is P_H 6·2. Nitrogen, supplied in the form of sodium nitrate, ammonium sulphate, or ammonium chloride, was found to be essential to sclerotial growth. Potassium dihydrogen phosphate was equal to potassium phosphate in the promotion of sclerotial formation, but magnesium phosphate and potassium nitrate were of relatively little value for this purpose.

C. solani made the most rapid mycelial growth at 28°, the minimum temperature permitting development being above 10° and the maximum between 35° and 40°. The thermal death points of the mycelium and sclerotia in five-minute exposures were 51° and 59°, respectively. Mycelial growth in cultures and in the soil was inhibited by solutions of 0·09 per cent. mercuric chloride, 0·30 per cent. copper sulphate, and 0·03 per cent. formaldehyde, but the fungus would probably be more resistant in the stem tissues. The sclerotia succumbed to 2½ hours' immersion in mercuric chloride (1 in 834) whereas a period of eight hours was necessary for cold formaldehyde (1 in 240) to produce comparable effects. These organs retain their viability for 2½ years in the laboratory and for five and seven months, respectively, on the surface of moist and dry soils in the field.

Control of the root rot may be effected by monthly irrigations of the plants along the ridges with a solution of kerol (1 in 1,400) or 2-2-50 Bordeaux mixture, beginning in September and ending in December. Soil sterilization by means of heat is a simple and effective method of prevention, carried out by burning rice straw, thatching grass, &c., until a temperature of 60° to 65° in the upper 9 in. is reached, the operation being performed four times and the soil thoroughly turned on each occasion.

McMartin (A.). **Fungicidal treatment of Sugarcane cuttings.** *S. Afr. Sug. J.*, xxiv, 12, p. 509, 1944.

The most promising of the fungicides tested for the control of pineapple disease of sugar-cane [*Ceratostomella paradoxa*] of recent years in Natal are those containing some form of organically combined mercury, of which only aretan and ceresan appear to be on sale in the country at the present juncture [*R.A.M.*, xxiv, p. 166]. Two other proprietary brands that have given satisfactory results are verdasan and agrosan. Aretan and verdasan are used at a strength of 0·5 per cent., ceresan and agrosan at 1 per cent. For canes of average diameter, such as Co. 281, 301, and 331, about 1 oz. per acre of the solution is required for single-stick planting, while for thicker varieties, e.g., P.O.J. 2725, the amount must be proportionately increased. The cost per lb. of aretan is 7*s.*, so that taking ¼ lb. per acre as an average figure, the treatment of an area of this extent would involve an outlay of 1*s.* 9*d.*

The same author contributes the opening section (pp. 511, 513) of Experiment Station Notes. A laboratory experiment was conducted in which the four above-mentioned preparations, thiosan, tulisan, spergon, vasco 4, cuprocide, nomersan, and arasan were applied to infected cuttings of Co. 331, ten being used for each treatment. After three weeks in a moist chamber, all the cuttings dipped in the first six were healthy, while the figures for those treated with the last five and for the controls were 8, 6, 6, 3, 3, and 4 out of 10, respectively. In another test, in which the pathogen was inoculated into the interior of the cuttings before treatment, no control was obtained, indicating that the fungicides are effective against external contamination only. When the ends of the cuttings were dipped in a spore suspension of *C. paradoxa* before treatment, infection was inhibited for only one week by verdasan, aretan, ceresan, agrosan, arasan, and spergon. In a field experiment the germination of the cuttings planted on 4th August after treatment with aretan, ceresan, spergon, verdasan, agrosan, and arasan was very significantly superior to that of the controls, the number of buds grown out of 1,200 on

13th November being 681, 623, 535, 707, 599, 540, and 370, respectively. Judged by the total population of shoots on the same date, only the aretan-treated material was significantly better than the controls (3,205 as against 1,493), but agrosan, verdasan, ceresan, arasan, cuprocide, and spergon also exerted a stimulatory effect on the number of cuttings growing one bud or more, viz., 272, 292, 284, 257, 267, and 270, compared with 274 for aretan and 194 for the controls, and might reasonably be expected to produce correspondingly large total populations at later dates.

Cross (W. E.). **Nuevos datos sobre el 'carbón' en las distintas variedades de Caña de Azucar.** [New data on 'smut' in the individual Sugar-Cane varieties.]—*Bol. Estac. exp. agric. Tucumán* 50, 35 pp., 1944.

From this fully tabulated survey of the performance in respect of smut [*Ustilago scitaminea*] of the sugar-cane varieties grown in Tucumán, Argentina [*R.A.M.*, xxiii, p. 408], it appears that up to the time of writing in December, 1944, only six of the 295 classified a year earlier as practically immune from the disease had acquired a greater degree of susceptibility, necessitating their transference to the category of severe infection. Conversely, 15 of the 74 varieties previously ranking as highly susceptible have developed a capacity to withstand the disease which warrants their inclusion in the group of mildly infected and resistant canes.

Arentsen (S.). **Hongos Uredinales que atacan a nuestros cultivos.** [Fungi belonging to the Uredinales that attack our crops.]—*Agric. tec. Chile* (formerly *Bol. Sanid. veg. Chile*), iv, 1, pp. 54–56, 1944.

A list is given of 22 rusts parasitizing economic crops in Chile [cf. *R.A.M.*, xxiii, p. 476].

Whiffen (Alma J.). **A discussion of taxonomic criteria in the Chytridiales.**—*Farlowia*, i, 4, pp. 583–597, 1 fig., 1 diag., 1944.

The author discusses the criteria on which a system of classification of the Chytridiales [*R.A.M.*, xxiv, p. 74] might be based and proposes that the monocentric Chytrids be grouped into two families, according to whether the zoosporangium proceeds from the encysted zoospore, as in the Rhizidiaceae, or from the germ-tube of the zoospore (Entophlyctaceae). A key to the genera of the monocentric Chytrids is furnished. For the present it seems advisable to retain in one family, the Cladochytriaceae Sparrow [ibid., xxii, p. 327] emend. Whiffen, the nine genera of the polycentric Chytrids.

Hirschhorn (Elisa). **Una especie de Ustilago nueva para la flora uruguaya (Ustilago microthelis Sydow).** [A species of *Ustilago* new for the Uruguayan flora (*Ustilago microthelis* Sydow).]—*Not. Mus. La Plata*, vii, pp. 21–26, 2 figs., 1 graph, 1942.

Erianthus trinius is recorded as a new host for *Ustilago microthelis* in Uruguay, and the smut is critically compared with *U. sacchari* and *U. scitaminea* [*R.A.M.*, xxiv, p. 74].

Greene (H. C.). **Notes on Wisconsin parasitic fungi. IV.**—*Farlowia*, i, 4, pp. 569–581, 1944.

Continuing the critical studies of the late J. J. Davis on the parasitic fungi of Wisconsin [*R.A.M.*, ix, p. 272; xxii, p. 374], the writer discusses, *inter alia*, the identity of the *Gloeosporium* responsible for a prevalent foliar die-back of greenhouse orchids, including species of *Cattleya*, *Cymbidium*, *Laelia*, *Odontoglossum*, and *Phalaenopsis*. Pending the opportunity for the further examination of a larger supply of material the pathogen is provisionally referred to *G. cinctum*. Consider-

able variation in the shape and size of the conidia was observed and it may be that more than one species of *G.* is involved.

A fungus characterized by light brown, elongated, somewhat flattened pycnidia, 200 to 500 by 75 to 125 μ, hyaline, simple, slender conidiophores, 5 to 6 μ in length, and hyaline, ellipsoid to subcylindrical conidia, 4 to 8 by 3 to 3·5 (mostly 6 to 7 by 3) μ, observed on *Panicum virgatum* leaves, was at first believed to be a species of *Sporonema*, but on subsequent evidence it is tentatively assigned to an early stage of 'tar spot' (*Phyllachora graminis*).

Cercospora alni n.sp. Chupp & Greene was collected on alder (*Alnus crispa*) leaves.

Wilted plants of *Astragalus canadensis* were found to be attacked by *Fusarium moniliforme* [*Gibberella fujikuroi*] and *F. tricinctum* or a closely related species. The former was present in abundance, and is probably the primary agent, though a necrotic virus may be involved and the fungi act only as secondary invaders, as has occurred on leguminous plants in California.

Dicoccum nebulosum was found on *Fraxinus americana* in a nursery in the University of Wisconsin arboretum.

Ryjkoff (V. L.) & Soukhov (K. S.). Влияние веществ, подавляющих и активирующих действие ферментов на некротическую реакцию, вызываемую вирусом **Nicotiana 1.** [The influence of substances inhibiting and activating the operation of the enzymes on the necrotic reaction induced by the *Nicotiana* 1 virus.] - *Биохимия* [*Biochemistry*], ix, 4, pp. 154–160, 1944. [English summary.]

When half leaves of a hybrid between *Nicotiana tabacum* and *N. glutinosa*, inoculated with the tobacco mosaic virus, were immersed in or floated on the surface of solutions of sodium fluoride, iodoacetate, soluble methyl-naphthoquinone, nicotinic acid, and riboflavin at concentrations of 0·05, 0·01, 0·05, 0·05 per cent., and full strength, respectively, necroses developed in the ordinary way. They were inhibited, however, in similar material placed within 24 hours of inoculation in ascorbic acid, cysteine, and thiamin at 0·05, 0·002, and 0·005 per cent., respectively. On transference to pure water, mosaic lesions began to appear in the half leaves that had been in contact with ascorbic acid and thiamin, showing that the action of these two substances is reversible.

Clayton (E. E.). **Resistance of Tobacco to blue mold (Peronospora tabacina).** - *J. agric. Res.*, lx, 3, pp. 79–87, 3 figs., 1945.

Tests with over 1,000 collections have failed to show any variety of tobacco possessing resistance to *Peronospora tabacina* adequate to provide a basis for a breeding programme. Tests with other species of *Nicotiana* have shown that some, especially Australian species, are highly resistant under certain conditions, the age factor being most important: they are susceptible up to six or eight weeks old, or if poorly developed, or when exposed to exceptionally severe attacks of infection. Successful crosses have been made between tobacco and *N. debneyi*, *N. megalosiphon*, *N. longiflora*, and *N. plumbaginifolia*. Work is in progress with the progeny.

Valleau (W. D.). **Can Tobacco blue-mold fungus be eradicated?**—Abs. in *Phytopathology*, xxxiv, 12, p. 1012, 1944.

Tobacco blue mould [*Peronospora tabacina*] was general in the Georgia-Florida area from 1931 onwards, but only in 1937 did it become prevalent in the Tennessee-Kentucky zone of cultivation, indicating that the latter does not lie in the direct line of spore dissemination from the former. During the last seven years the incidence of infection in the Tennessee-Kentucky area has gradually fallen, until in 1944 only two cases were recorded. It would appear, therefore, that *P. tabacina*

cannot maintain itself indefinitely north of the Georgia-Florida region, and there the eradication of overwintering living plants and the use of new seed-bed sites should result in the complete eradication of the pathogen from the eastern tobacco-growing zone in a comparatively short time.

Hopkins (J. C. F.). **Diseases of fruit, flowers, and vegetables in southern Rhodesia. 9. Diseases of Tomatoes.**—*Rhod. agric. J.*, xlii, 1, pp. 81–87, 8 figs., 1945.

The author gives brief, popular notes on the symptoms and control of tomato diseases commonly present in Southern Rhodesia, including damping-off (*Rhizoctonia* [*Corticium*] *solani*), leaf spot (*Septoria lycopersici*), buck-eye rot (*Phytophthora parasitica*), mouldy fruit rot (*Rhizopus nigricans*) [*R. stolonifer*], water wound rot due to various bacteria, physiological blossom-end rot, green back and fruit cracking due to sun injury and, perhaps, potash deficiency, mosaic, bunchy top [*R.A.M.*, xv, p. 124: xvii, p. 442], and spotted wilt, only one instance of which on tomatoes has so far been recorded in the Colony [ibid., xix, p. 568].

The non-parasitic diseases of Tomatoes.—*Agric. Gaz. N.S.W.*, lvi, 1, pp. 17–20, 4 figs., 1945.

Several diseases of the tomato are not of fungal origin, though they may facilitate the attack of secondary fungi, but are due to cultural conditions. Blossom-end rot may be due either to an insufficient supply of water from the roots in hot weather, when water may be withdrawn from the fruit to the leaves, or to clogging of the soil with too much water, or to a deficiency of superphosphate and excess of nitrogenous fertilizer. The same causes may result in abnormal flower production and poor pollination leading to blossom-drop. Cold and rain will also bring about this condition. Excess of moisture in the air or soil produces leaf roll resembling that of potato in appearance, but it does not as a rule affect the yield of fruit. Sunscald, the appearance of a white or yellow patch on the 'shoulder' of the fruit, is due to exposure through defoliation by early blight [*Alternaria solani*], *Septoria* spot [*S. lycopersici*], or tomato mite.

Notes on growth cracks and soil deficiencies are also given.

Nagel (C. M.). **A new organic fungicide, 2, 3, dichloro-1, 4-naphthoquinone : its value as a control for certain defoliation diseases of the Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1009, 1944.

In experiments on the control of three agents of foliar diseases on Victor tomatoes, namely, *Phytomonas* [*Xanthomonas*] *vesicatoria*, *P.* [*Pseudomonas*] *punctulans*, and *Septoria lycopersici*, 2, 3, dichloro-1, 4-naphthoquinone, applied at 1½ lb. per 100 gals. water four times between 14th July and 17th August, markedly excelled all the other materials tested in the maintenance of the leaves without damage to the plants.

Andrus (C. F.) & Reynard (G. B.). **Resistance to leaf spot and its inheritance in Tomatoes.**—*Phytopathology*, xxxv, 1, pp. 16–24, 2 figs., 1945.

All the 127 commercial tomato varieties tested at the Southeastern Regional Vegetable Breeding Laboratory, Charleston, South Carolina, for their reactions to *Septoria lycopersici*, inoculum of which was prepared by means of a mechanical liquefier [*R.A.M.*, xx, p. 546], proved highly susceptible, but some degree of resistance was observed in 12 out of 267 accessions adjudged to be of *Lycopersicon hirsutum* or *L. peruvianum* descent [ibid., xxii, p. 502], or to have originated through out-crossing with some primitive type. The maximum degree of resistance is expressed by abnormally small, dark reddish-brown lesions, bearing few or no pycnidia. The results of inheritance studies of crosses between the susceptible varieties Rutgers and Victor and the resistant M6 line were made on 916 F_2 plants,

as well as on 3,630 F_3 offspring and 20 true and pseudo-back-crosses, the latter involving Gulf State, Montgomery, Pan America, and Indiana Marglobe, indicated that resistance, represented by the circumscribed type of lesion (symbol Se se), is inherited as a single dominant factor.

REYNARD (G. B.) & ANDRUS (C. F.). **Inheritance of resistance to the collar-rot phase of Alternaria solani on Tomato.**—*Phytopathology*, xxxv, 1, pp. 25–36, 1 fig., 1945.

Following up earlier investigations [*R.A.M.*, xxii, p. 116], the writers conducted experiments at the United States Vegetable Breeding Laboratory, Charleston, South Carolina, involving the crossing of tomato lines uniformly resistant and uniformly susceptible to the collar-rot phase of *Alternaria solani* and the analysis of succeeding generations for their reactions to the disease. A total of 500 F_1 seedlings, 15 F_2 populations, 251 F_3 families, and 23 back-cross populations composed of crosses between resistant and susceptible parent lines was tested, the plants being inoculated in the seedling stage, grown in soil on greenhouse benches, and classified in five grades according to the severity of the resultant infection.

Unequivocal segregation for resistance occurred in the hybrids and the analysis of F_2, F_3, and back-cross populations indicated a simple form of inheritance in which one pair of factors is concerned. An intermediate type of response was observed in which susceptibility to collar rot appeared to be only partially dominant over resistance. The resistance of plants of the F_2 and subsequent generations seemed to be equal to that shown by the parent lines.

The forcing variety, Devon Surprize, was used as the principal collar rot-resistant parent, while the susceptible progenitors included Rutgers, Valiant, Victor, Gulf State, Marglobe, Montgomery, Stokesdale, Pan America, Mingold, Red Pear, Red Cherry, and Vetomold. By an adaptation of Langford's system of symbols for reactions to *Cladosporium fulvum* [ibid., xvi, p. 571], the factor pair governing resistance to the collar-rot phase of *A. solani* is designated 'Ad-ad'.

BARRATT (R. W.) & RICHARDS (M. C.). **Physiological maturity in relation to Alternaria blight in the Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 997, 1944.

All tomato varieties and selections available at the moment have been found susceptible to *Alternaria solani* when tested under conditions favouring infection. Differences in the extent of field defoliation from this cause were shown by three years' experiments to be related to the physiological maturity of the plants. A correlation was further established between the period of yield and time of defoliation irrespective of variety. Early varieties, or early plantings of a variety, lose their foliage prematurely because they begin to yield early. A connexion likewise exists between the fruit load of a plant, expressed by the fruit to leaf quotient, and defoliation, evidence of which was secured in an experiment on 16 varieties with a wide range of production, the change in the quotient being followed in four varieties by means of weekly samples.

ELAZARI-VOLCANI (ZAPHIRA). **Observations on Sclerotinia sclerotiorum in Palestine.**—*Palest. J. Bot.*, R. Ser., iv, 2, pp. 206–207, 1944.

Sclerotinia sclerotiorum is stated to be continually extending its host range in Palestine, among the important diseases of economic crops for which it is responsible being fruit and stalk rots of vegetable marrows and eggplants and fruit rots of bananas and oranges. In an inoculation test to determine the pathogenicity of the fungus to tomatoes, one out of five seedlings contracted the disease after 16 days, sclerotia being detected in the pith of its wilted stalk. All the controls remained healthy.

Apothecia [cf. *R.A.M.*, xx, p. 76] have very rarely been observed to develop

from sclerotia in the field, but during the cold winter of 1941–2 they were produced on citrus fruits after transference to the laboratory, on the soil of a vegetable marrow plot and tomato seed-bed near Tel Aviv, and on the soil in the pots used in the above-mentioned tomato experiment. The diameter of the apothecial disk measured 3 to 15 mm., the length of the stalk 5 to 35 mm., and the spores 9 to 12 by 4·5 to 6·5 μ.

The minimum, optimum, and maximum temperatures for mycelial growth in glucose agar cultures were 4°, 14° to 25°, and between 30° and 35° C., respectively. Slight discrepancies between these results and those of other workers suggest the desirability of a comparative study of material of *S. sclerotiorum* from a variety of geographical sources.

WALLACE (E. R.). **Didymella stem rot of Tomato.**—*Kirton agric. J.*, *1945*, 10, pp. 21–3, 1945.

Brief notes are given on *Didymella* [*lycopersici*], first recorded from Lincolnshire in 1942 [*R.A.M.*, xxii, pp. 378, 467; xxiv, p. 90]. Control measures are indicated.

KENDRICK (J. B.). **Rhizopus stem blight of Tomato.**—Abs. in *Phytopathology*, xxxiv, 12, p. 1006, 1944.

A species of *Rhizopus* resembling *R. nigricans* [*R. stolonifer*] has been isolated from the internal discoloured pedicel and stem tissues of canning tomato plants in central California, where the fungus is responsible for a troublesome fruit rot and subsequent blighting of the stems. Growth cracks or other injuries provide the means of ingress on fruits that have ripened early, usually under heavy foliage where atmospheric humidity is rather high. Invaded fruits are converted first into soft, watery masses and then into mummies, whence the fungus frequently enters the pedicel, fruit spur, and main branch. The entire fruit spur is blighted and elongated, dark brown, sunken lesions develop on the main branch above and below the point of attachment of the spur. The yellowing and blighting of the foliage following the attack on the main branch are liable to confusion with wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*].

PAVLÍK (M.). **Eine neue Bakteriose der Tomaten? Vorläufige Mitteilung.** [A new Tomato bacteriosis? Preliminary note.]—*Z. PflKrankh.*, liv, 1–2, pp. 1–4, 1944.

Diseased tomato fruits from Lodenitz (Lower Danube) examined in 1942 bore scab-like lesions, 3 to 5 mm. in diameter, surrounded by a yellowish to greenish halo, which gave rise on various standard media at 27° C. to a non-spore-forming, actively motile, Gram-positive bacterium, 0·8 to 2·5 by 0·5 to 0·8 μ, occurring singly or in pairs and furnished with peritrichous flagella. Glucose, lactose, and saccharose were fermented without gas formation, nitrates reduced to nitrites, gelatine liquefied, bouillon clouded, milk coagulated, litmus milk acidified, and indol formed, but hydrogen sulphide was not produced, nor were starch or cellulose dissolved.

Inoculation experiments on green or half-ripe, freshly-gathered tomatoes resulted in the development of whitish, watery areas, 2 to 5 mm. in diameter, from which the organism described above was isolated. Although it is probably the agent of the fruit spot, no definite conclusions as to its part in the etiology of the disease can be drawn pending an opportunity for the artificial infection of tomatoes on growing plants.

WRIGHT (E.). **Relation of macrofungi and micro-organisms of soils to damping-off of broadleaf seedlings.**—*J. agric. Res.*, lxx, 4, pp. 133–141, 2 figs., 1945.

In greenhouse and field tests carried out on Marshall silt loam soil at the Nebraska Agricultural Experiment Station from 1937 to 1939, an apparent correlation was

observed between the occurrence of macrofungi and the frequency of damping-off in broadleaf seedlings [*R.A.M.*, xxiv, p. 38]. The sporophores of *Cyathus vernicosus*, for instance, were prevalent in soils favourable to the growth of the seedlings in which the incidence of disease was low, whereas in the case of *Naucoria semiorbicularis* and *Coprinus* spp. the position was reversed. In general, the larger the number of fungi in the soil, the heavier were the losses from damping-off, an abundance of bacteria, on the other hand, usually connoting only slight reductions from this source. A yellow *Aspergillus* predominated in peptone-glucose agar dilution plates from soil sample, and on dried agar-coated slides. On the basis of the data so far obtained, it appears unlikely that detailed microbiological analyses of the soil will prove of practical utility in the prediction of losses from damping-off.

Schwerdtfeger (F.). **Die Waldkrankheiten. Ein Lehrbuch der Forstpathologie und des Forstschutzes.** [Forest diseases. A text-book of forest pathology and forest protection.]—479 pp., 230 figs., Berlin, P. Parey, 1944. Rm. 24. [Review in *Z. PflKrankh.*, liv, 1–2, pp. 38–39, 1945.]

The reviewer, [H.] Blunck, points out that the present manual is the first attempt, since the publication of Morstatt's 'Introduction' two decades ago [*R.A.M.*, ii, p. 562], to compile a phytopathological text-book, and it is restricted to one branch of the subject. Within these limits, however, the material is comprehensively handled, the term 'disease' being interpreted in its broadest sense, and comprising, besides pathogenic agents proper, various non-parasitic troubles, including smoke injury and adverse soil conditions. Special attention is devoted to silvicultural hygiene and therapy.

Gruenhagen (R. H.). **Hypoxylon pruinatum and its pathogenesis on Poplar.**—*Phytopathology*, xxxv, 1, pp. 72–89, 1 fig., 2 diags., 4 graphs, 1945.

The prevalence of the canker caused by *Hypoxylon pruinatum* on poplar (mostly *Populus tremuloides* and *P. grandidentata*, *P. balsamifera* being affected to a lesser extent) [*R.A.M.*, xix, p. 505] was investigated in Wisconsin during the summers of 1941 to 1943. The disease, the leading source of infection on poplars in the Lake States, especially on poor growing sites, was found on an average of 24 per cent. of all the trees examined, characteristic features of the invaded stands including broken trees, dead stubs, and blackened areas on the green trunks. Cankers that girdled branches produced brown 'flags', and if the branches beyond the site of infection were not dead, the foliage was usually stunted and pallid. Incipient cankers appeared as yellow to orange, slightly sunken lesions in the bark, generally with irregular, lobate margins, while at a later stage blister-like conidial fructifications and erumpent perithecial stromata were plainly discernible.

H. pruinatum attained its maximum diameter and produced the heaviest weight of mycelium in 2 per cent. malt agar cultures at 28° C.; good growth was made over the range from 20° to 28° but none occurred at 4°, 8°, or 36°. The optimum hydrogen-ion concentration was P_H 5·6, with satisfactory development from 4·5 to 6·5. Malt agar was the best of the several standard media tested for rapidity of development and conidial production.

The organism is a wound parasite on branches and trunks, but buds, leaves, petioles, and leaf axils did not contract the disease. Only a moderate percentage of infection developed from inoculations made through cuts, but all experiments in which the trunk and branch bark was bruised and wounded before the insertion of the inoculum were successful. The fungus penetrated the bark, cambium, and a distance of 8 mm. into the wood.

Overwintering was shown to be effected by means of the mycelium in the host tissues and ascospores, and the organism is also disseminated by wind. In spore-trap experiments the conidia were detached under both wet and dry

conditions, but free water was necessary for ascospore discharge, which did not take place in the early spring or late autumn when the mean temperature was below 45° F.

The above-mentioned bruised-tissue inoculation technique has enabled a method to be developed for testing the relative resistance to *H. pruinatum* of various poplar selections.

BRETZ (T. W.). **Observations on phloem necrosis of Elm in Kentucky, Ohio, Indiana, and Illinois.**—*Plant Dis. Reptr*, xxviii, 35, pp. 1056–1057, 1944. [Mimeographed.]

After stating that phloem necrosis [*R.A.M.*, xxiv, p. 126] has caused extensive dying of elms in scattered parts of the State of Missouri, particularly in St. Louis and Kansas City, where the American elm [*Ulmus americana*] and its varieties are extensively planted for shade purposes, the author points out that as the disease is new to Missouri, it is difficult to predict what course it will take. A journey to Lexington, Kentucky, where the disease is thought to have been present for many years, Dayton, Ohio, where it has been known since 1927, and Columbus, Ohio, where it was very damaging in 1944, was therefore undertaken to obtain information on this point. On the trip to Kentucky and on the return to Missouri from Ohio, evidence of phloem necrosis was observed at scattered points across southern Illinois and Indiana. Near Lexington, many planted elms 15 to 25 years old were affected. Here, however, a number of native elms survive, which antedate the earliest supposed occurrence of phloem necrosis, and have, presumably, been intermittently exposed to the disease, as indicated by the active development of the condition in younger trees in recent years. This strongly suggests that these trees are resistant to, and possibly immune from, phloem necrosis. Evidence of the disease was observed along the route from Lexington to Cincinnati. Between Cincinnati and Dayton, elms were very scarce, while in the latter city the destruction appeared to be almost complete; the number of dead and dying trees exceeded the number of healthy ones noted, and it was estimated that 20,000 trees had died from the disease in 1944. In Columbus, the disease likewise destroyed many thousands of trees during the past season.

PRICE (W. A.) & TILSON (H. G.). **Some plant and insect problems of Kentucky nurserymen during the year ended June 30, 1944.**—*Bull. Ky agric. Exp. Sta.* 41, Regulatory Ser., 20 pp., 1944.

Particulars are given of the Kentucky Nursery Inspection Law and its application to some well-known pests and diseases occurring in the State during 1943–4.

Service and regulatory announcements, December, 1944. Plant-quarantine import restrictions, Union of South Africa.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 65–66, 1944.

By Proclamation No. 48 of 1940, Portuguese East Africa may be added to the list of countries from which a certificate of absence of *Synchytrium endobioticum* is not required to accompany consignments of potatoes for South Africa.

From and after the date of publication of Government Notice 1282 (1942), no person shall introduce into the Union, unless under a specially written authorization of the Secretary of Agriculture and Forestry, any timber or wood (*a*) with bark adhering to it, or (*b*) infested by insects or infected by fungi.

List of current quarantine and other restrictive orders and miscellaneous regulations.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, pp. 66–72, 1944.

Summaries are given of the domestic and foreign quarantine and other restrictive orders now operative in the United States.